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EDITORIAL DEPARTMENT NOTE

It cannot be emphasized too often that good cost control requires certain fundamentals involving physical control of methods, procedures, operations, etc. Cost control cannot be effective unless materials, manpower, machines, and tools are harmoniously balanced. Our first article in this issue illustrates the interlocking relationships between physical aspects of operational control and the resulting flow of information leading to cost control.

C. J. Peters, author of the first article, is a member of the Portland Chapter. He has for sixteen years been in intimate contact with industrial accounting, engineering, and management problems in the textile, food-processing, and metal-working industries. For the past five years he has been with the Iron Fireman Manufacturing Co. where he has been engaged in the development, installation, and operation of production planning and control procedures in the company's factories at Portland, Oregon, and Cleveland, Ohio.

The modern trend of including paid vacations in labor contracts made it necessary to accrue vacation pay, especially in the case of large companies. What appears at first glance like a simple proposition becomes more complex because of the varying lengths of vacation periods, varying rates of pay, etc. Clair W. Bendel therefore has performed a valuable service in sharing with our readers the system successfully developed and applied in his company.

Mr. Bendel received his accounting training from the International Accountants' Society and extension courses of Pennsylvania State University. His early business experience included the retail trade, stove manufacturing, bakery products, and casualty insurance accounting fields. He spent thirteen years in cost accounting for textile machinery. For the past three years he has been with the Jacobs Aircraft Engine Co. as Budgets and Statistics Supervisor.

Articles published in the *Bulletin* present many different viewpoints. In publishing them the Association is not sponsoring the view expressed, but is endeavoring to provide for its members material which will be helpful and stimulating. Constructive comments are welcomed and will be published in the Forum Section of the *Bulletin*.

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MAY 15, 1946

CASE STUDY OF PRODUCTION AND COST CONTROL

**By C. J. Peters, Industrial Engineer,
Iron Fireman Manufacturing Co.,
Portland, Ore.**

IN the simplest form of manufacture, a man decides what it is he wishes to make and then goes into the shop and makes it himself. He decides for himself the type or kind of material he wishes to use, purchases it himself, gathers whatever tools will be necessary, and goes to work. Taking the material in its raw or purchased form, he carries through by himself each separate step —one at a time—and produces the finished article. If the article he is making consists of several components, he makes each one as needed and finally fits them together to make the finished article. He is a one-man going concern and obviously very little in the way of planning and control of production is necessary. If he alone constitutes the sales organization, the coordination of sales with production will be relatively simple.

In the step beyond this simplest form of manufacture, we find a manager, owner, or boss in a small work shop. He directs the work of one or more individuals under him. We find here the first evidence of a principle—the division of labor—in a manufacturing enterprise. He may be owner and salesman of a small workshop, where he has employed one or more individuals to take over the work of making the product and will himself assume the roles of manager, salesman, purchasing agent, accountant, and production superintendent. He may issue simple orders and instructions to those working for him, either in oral or written form. If he personally supervises their work and is fortunate enough to have men who are skilled and thoroughly familiar with the manufacture of the product, very few, if any, complex problems in production planning and control are likely to arise. The boss merely issues instructions to his workmen as to what to make, how many to make, and when to begin making them. Each workman works on the material or materials through all operations to the finished form, each using to a large degree his own judgment as to the tools and methods to be used.

Need for Production Planning and Control

In modern industry, however, manufacturing is conducted on a very much more complex basis than the one just described. A few of the factors which tend to create a more complex situation are as follows:

1. Number of ultimate parts in the product.
2. Number of different operations performed on each part.
3. Extent to which operations are dependent on others, that is, operations which cannot be performed until previous operations have been completed.
4. Variation in capacity of machines for different classes of work. In many industries, the speed of machines will vary according to the nature of materials.
5. Degree to which subassemblies exist.
6. Interchangeability of parts in assembly.
7. Volume of customer orders with specific delivery dates.
8. Receipt of orders for many small lots.

To the extent that any of these factors enter the picture, complexity of operation will increase, and as the scale of operations increases in volume, techniques of planning, coordination, and control of production, far beyond those of the typical small alley shop, are necessary to avoid confusion and chaos.

Classification by Types of Industrial Operations

The type of control technique most suited to a particular industrial operation will vary with the type of industry. Generally speaking, most industrial enterprises will fall into one of four distinctive classifications so far as the type of planning and control procedures is concerned. In the order of degree of complexity of operations and corresponding variation in type of controls required, these classifications or types may be briefly described as follows:

1. Continuous—fixed path—process industries where raw materials enter at one end of the factory and follow a fixed path from process to process, or operation to operation. The selection of equipment is not optional but is predetermined by the natural sequence of the process. Manufacture of paper, food products, glass, soap, and textiles are examples of industries falling in this classification.

2. The second classification is made up of industries engaged in the manufacture of such products as garments, shoes, and the like. The finished products consist of a number of component parts; however, the processes by which each component is produced are not optional. This type of industry requires a somewhat more complicated form of coordination of planning and control than the first type, however, not to the extent that the third classification requires planning and control.
3. The third type embraces such industries as job printing, jobbing and machine repair shops, jobbing foundries, the manufacture of special equipment, and other heavy construction. In these cases, there is manufacture to orders which may or may not be repeated at regular or irregular intervals. Obviously, considerable planning is necessary in the preparation of work programs and schedules, and some means of regulating the progress of the numerous individual subdivisions of the project is also necessary.
4. The fourth and most complex type is that to be found in the repetitive or mass production of automobiles, refrigerators, typewriters, radios, automatic coal stokers, oil burners, and other appliances of similar character. In this type of manufacture, the product is made up of numerous component parts and subassemblies. Many different raw materials are used. Each component part may follow a new and different path through the shop to final assembly. It is readily apparent that some control and direction must be given to the movement of materials in accordance with some preconceived over-all plan to obtain the most efficient results.

In order to obtain these results and to gain the proper coordination of men, materials, and machines to this end requires the highest degree of production planning and control.

The purpose of this paper, therefore, is to outline a procedure of production planning and control that has proved successful during a period of conversion from a peacetime to a wartime basis of operation, and again through the period of reconversion to peacetime production. During the reconversion period, the com-

pany in this case is now introducing many new models and design changes to its regular line of automatic coal stoking and oil burning equipment. It is from the point where the development engineering department has released design specifications for a new product that this paper will review the production planning and control procedures.

Functions of Planning and Control

Between the time specifications for a new product are released by the development engineering department and the time actual production can begin, there are a number of important preliminary steps or phases in production engineering that must be completed. The function of production engineering can be divided into two sections:

1. Production planning.
2. Production control.

The principal functions of planning are:

1. To analyze the design from a manufacturing standpoint.
2. To prepare manufacturing drawings and blueprints.
3. To determine the kind and quantity of raw materials required.
4. To plan manufacturing processes.
5. To design and provide tools, jigs, or fixtures.
6. To provide machinery.
7. To establish time or output standards.
8. To establish quality standards.

The principal functions of control are:

1. To determine quantities to be manufactured, in accordance with sales schedules.
2. To release purchase requisitions for the necessary quantities and kinds of raw materials.
3. To develop production schedules.
4. To release fabrication and assembly orders in accordance with these schedules.
5. To dispatch work through the shop, starting each operation at the time set and seeing to it that all materials and tools required are at hand when needed.

6. To maintain a record of all movement of material with respect to operation schedules.
7. To collect and maintain records of production.
8. To prepare daily listings of all critical schedules.
9. To analyze and summarize conditions adversely affecting performance of schedules.
10. To prepare daily lists of critical costs and performances.
11. To analyze and summarize conditions which are incurring costs in excess of predetermined cost standards.
12. To maintain machine load records as a basis for determining fluctuating manpower requirements and prevent bottlenecks or overloads on certain machines.

These steps can be illustrated more clearly by referring to the Production Control Flow Chart shown as Exhibit 1. On this chart are purposely omitted all details which are more or less found in any cost accounting system, the purpose of the chart being to show only principal features of the planning and control procedures we have in operation in our factories. The flow of certain accounting documents, posting media, and engineering forms, therefore, has been omitted for the purpose of clarity.

All design releases from the development engineering department are thoroughly studied and anaylzed by the production engineering department before the product can be released for production. While there is close collaboration between these two departments, design engineers will frequently look upon a product purely from a functional or operating viewpoint and overlook the production or manufacturing problems inherent in the design. Original design specifications of a part, or group of parts, may be such that individual or cumulative tolerances, types of materials, and required finishes may have to be revised by the production engineering department to make for greater economy in production.

After the necessary changes have been approved by both development and production engineering departments, the actual job of production planning may begin. The material control section sets in motion the ordering and purchasing of the necessary amounts and types of materials as determined by the sales and assembly schedules.

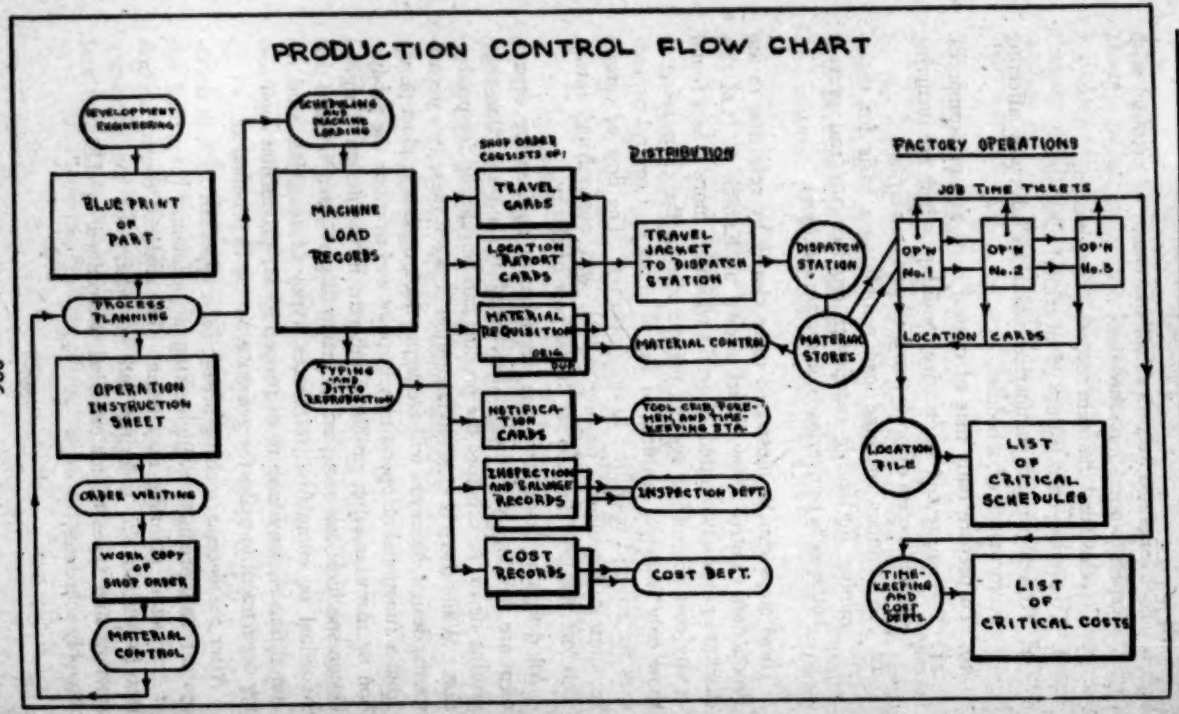

EXHIBIT 1

IRON FIREMAN MANUFACTURING COMPANY
PORTLAND DIVISION

OPERATION INSTRUCTION SHEET

(F.M. P.204)

MAINTAIN RECORD OF SPEEDS AND FEEDS USED

OP'N. NO.	OPERATION NAME AND DETAILS	DEPT. OR MACHINE NO.	DESCRIPTION OF MACHINE AND TOOLS	SPEED PER REV.	FEED PER REV.	SET UP	PCS. PER	STANDARD HOURS	% ALT. MACH.	IMP

EXHIBIT 1

IRON FIREMAN MANUFACTURING COMPANY
PORTLAND DIVISION
FM 2304

OPERATION INSTRUCTION SHEET

MAINTAIN RECORD OF SPEEDS AND FEEDS USED

OP'N. NO.	OPERATION NAME AND DETAILS	DEPT. OR MACHINE NO.	DESCRIPTION OF MACHINE AND TOOLS	SPEED R.P.M.	FEED PER REV.	SET UP HOURS	PCS. PER HOUR	STANDARD HOURS PER PC.	% ALT. MACH. ALLOW.
10	INSPECT & CHECK MAT. AS PER B.P.		INSPECTION						
20	TURN .798 (+.002-.002) DIA. X 1-3/64 REF. LENGTH TURN .888 (+.002-.002) DIA. X 1/2 LENGTH TURN 1.012 (+.002-.002) DIA. X 1-3/16 LENGTH CENTER DRILL GROOVE AND CHAMFER BREAK SHARP EDGES CUT OFF TO 14-1/8 LENGTH	2010 2015 2016	TURRET LATHE NO FIXTURE REQUIRED (1) 3/8 CENTER DRILL, TURNING, GROOVING AND CHAMFERING AND CUT OFF TOOLS (2) .800/.796 ADJ. SNAP GAGES (2) 1.014/1.010 ADJ. SNAP GAGES (2) .727/.721 SPEC. SNAP GAGES GAGE NO. 7 G-16156-5			1.5	15	.0667	
77	COUNT AND RECORD PARTS INTO PRODUCTION ON TRAVEL CARD		DISPATCH						
30	TURN .798 (+.002-.002) DIA. X 1-25/64 REF LENGTH CENTER DRILL FORM 15/16 DIA. X 1-3/8 LENGTH FORM 90° TO .790/.780 DIA. AND 1.015 (+.002-.002) DIA. SHOULDER (2) PLACES TURN 1.015 (+.002-.002) DIA. TO RELIEF	2010 2015 2016	TURRET LATHE NO FIXTURE REQUIRED TURNING, GROOVING AND CHAMFERING TOOLS TO SUIT (1) 90° FORMING TOOL WITH 1/16 RAD. (2) .800/.796 ADJ. SNAP GAGES (2) 1.017/1.013 ADJ. SNAP GAGES (2) .727/.721 SPEC. SNAP GAGES G-16160-2 (GAGE NO. 7) SPEC. LENGTH GAGE 3/8 CENTER DRILL			2	25	.0400	
	(CONTINUED ON PAGE TWO)					TOTALS		.1067	

IMPORTANT — IF THESE INSTRUCTIONS CANNOT BE FOLLOWED AS LAID OUT, NOTIFY ENGINEERING DEPARTMENT IMMEDIATELY TO OBTAIN REVISED INSTRUCTION. UNAUTHORIZED DEVIATIONS ARE NOT PERMITTED.

PART NAME	SHAFT	MATERIAL	1-1/16 DIA. C.R. SAE X1335	CORRECT TO B.P.		PROCESS APPROVED BY:	SHEET NO.
PART NUMBER	16160	P. O. NO. 7385	CUSTOMER IFM	MIN. QUAN.	(2)	1/22/46	XBS	1 OF 3
				MAX. QUAN.			TOOLS APPROVED BY: LB	DATE ISSUED	REV. NO.

EXHIBIT 2

Process and Tool Planning

It becomes necessary at this point to determine the precise method by which each part is to be fabricated, to lay out the details and sequence of operations to be performed, and to provide the necessary tools to perform the work. Usually a tentative method is laid out by a process engineer on what we call an operation instruction sheet (Exhibit 2). Where necessary and where several alternate methods of tooling and machining are possible, the process engineering, tool design, and production department heads confer and decide upon a specific method. The final approved operation instruction sheet bears complete information as to part name and description, material specifications, description and sequence of operations, machines, jigs, fixtures, cutting tools, and gauges to be used, together with machine feeds and speeds, setup time allowances, production rate in pieces per hour, and standard hours per unit for each of the operations.

Sufficient copies are reproduced to provide distribution to all departments concerned as well as the tool crib for issuance with the tools whenever the individual operations are to be performed.

Preparation of Shop Orders

Let us assume that materials have been ordered and are in stock and that tools have been completed and proved by the tool room. Sales schedules or forecasts have determined the assembly schedules, which, in turn, have established the stock dates for all the components to be manufactured. The varying lengths of time necessary to put each lot of parts through the numerous and varying operations will determine an order writing schedule. Orders for parts which require more time to process will be released first and those of short manufacturing cycles last. All are determined by the number of days in the manufacturing cycle and the date the parts are required for assembly.

An order writer prepares a work copy of a shop order (same design as Exhibit 3) which may be either a fabrication order or an assembly order for subassemblies. On this he writes:

1. Part number, name, and description.
2. Assembly number in which next used.
3. Factory order and release number used to identify the order for control and accounting purposes.

IRON FIREMAN MANUFACTURING COMPANY — CARD 1 OF 1 — mod 2/1/46

SHOP TRAVEL CARD

PART NUMBER	PART NAME	CUST.	CONT. OR P. O. No.	PART NUMBER	FACTORY ORDER No.
16160	Shaft	IFM	BC	16160	C-7385

USED ON ASS'Y	QTY.	MATERIAL	SIZE	SPECIFICATION	QTY PER UNIT	DATE TO START	DATE TO COM.	QUAN. THIS ORDER
16100	1	Bar Steel	1-1/16" Dia.	C.F. X1335 (Issue 201 Bars of 16' ea.) IFM PURCH MAT'L	14.375"	2-4-46	3-29-46	2600

QUAN. MAT'L. REQ'D. 3216' — LOT NO. — QUAN. THIS LOT — TRAYS / BOXES / SKIDS

OP'N. NO.	OPERATIONS—FOR DETAILS REFER ISSUE OF 2-1-46	MACH. OR DEPT. NO.	SET UP HOURS	PCS. PER HOUR	TOTAL HOURS	SH'T.	SCHEDULE START	SCHEDULE FINISH	✓	CO. INSP.	GOV'T. INSP.
1 10	INSPECT & CHK MAT'L	INSP					2-4	2-4			
2 20	TURN-CENTER DRILL, ETC.	2017	1.5	15	174.8	1	2-4	3-5			
3 77	COUNT & RECORD	DISP									
4 30	TURN-CENTER DRILL-FORM, ETC.	2022	2	12	218.7	1	2-4	3-12			
5 40	MILL (2) WOODRUFF KEYWAYS	1578G	.5	60	43.8	1	2-8	3-13			
6 50	DRILL (2) HOLES	1791G	.5	25	104.5	1	2-11	3-15			
7 60	MILL-BURR	1524G	1.5	60	41.8	1	2-13	3-18			
8 70	H.T. BOTH ENDS TO ROCKWELL "C"	TOCCO	.5	40	65.5	1	2-14	3-19			
9 80	ROCKWELL	INSP					2-15	3-20			
10 90	STRAIGHTEN IF NECESSARY	2742	.5	40	65.5	1	2-18	3-21			
11 100	GRIND .786	1941G	.5	18	144.9	1	2-19				
12 110	GRIND 1.000	1941G	.5	18	144.9	1					
13 120	GRIND 1.000	1941G	.5	18	144.9	1					
14 130	GRIND .876	1941G	.5	30	87.2	1		3-27			
15 140	BURR	2300		50	52.0	1	2-22	3-28			
16 150	INSPECT & COUNT	INSP				1	2-25	3-29			
17 160	MOVE TO PLANT #2	SHIP						3-29			
18											
19											
20		TOTAL	HOURS		1291.5						
21											

V1-506 MFG

EXHIBIT 3

4. Quantity to be manufactured.
5. Desired stock date.
6. List of operation names and numbers.
7. Department or machine numbers for each of the operations.
8. Setup hours for each operation.
9. Standard pieces per hour for each operation.
10. Total hours, setup, and production hours for each operation. (Total pieces required divided by pieces per hour, plus setup time.)
11. Date of operation instruction sheet to be used in the shop.
12. Size, type, and specifications of material to be used; also, the quantity required per unit and the quantity required for the total order.
13. As a final operation, he will indicate the disposition to be made of the finished parts, such as, whether to ship them on a customer's purchase order or to move and store the finished parts at some specified assembly parts storeroom.

At this point, the work copy is forwarded to material control to be checked for availability of the material specified. If the material is not available, the work copy is held by material control until the material is available. However, should the material be available, the work copy is then forwarded to the process planning section, where it is checked to make certain that the latest developed methods or tooling have been prescribed. Frequently, there are changes in methods and tooling pending, and revised operation instruction sheets may not yet have been distributed. If the delay is not too serious, the work copy may be held and later altered to conform to the latest revised instruction sheet.

Scheduling and Machine Loading

If no changes in methods are pending, the work copy of the shop order is forwarded to the scheduling and machine loading section. Here a very important phase of control takes place. A machine load record (Exhibit 4) is prepared each month for the next one or two succeeding months. A column is provided for each machine in the shop and horizontal spaces for each day of the calendar month. A red pencil line will be used to rule out the

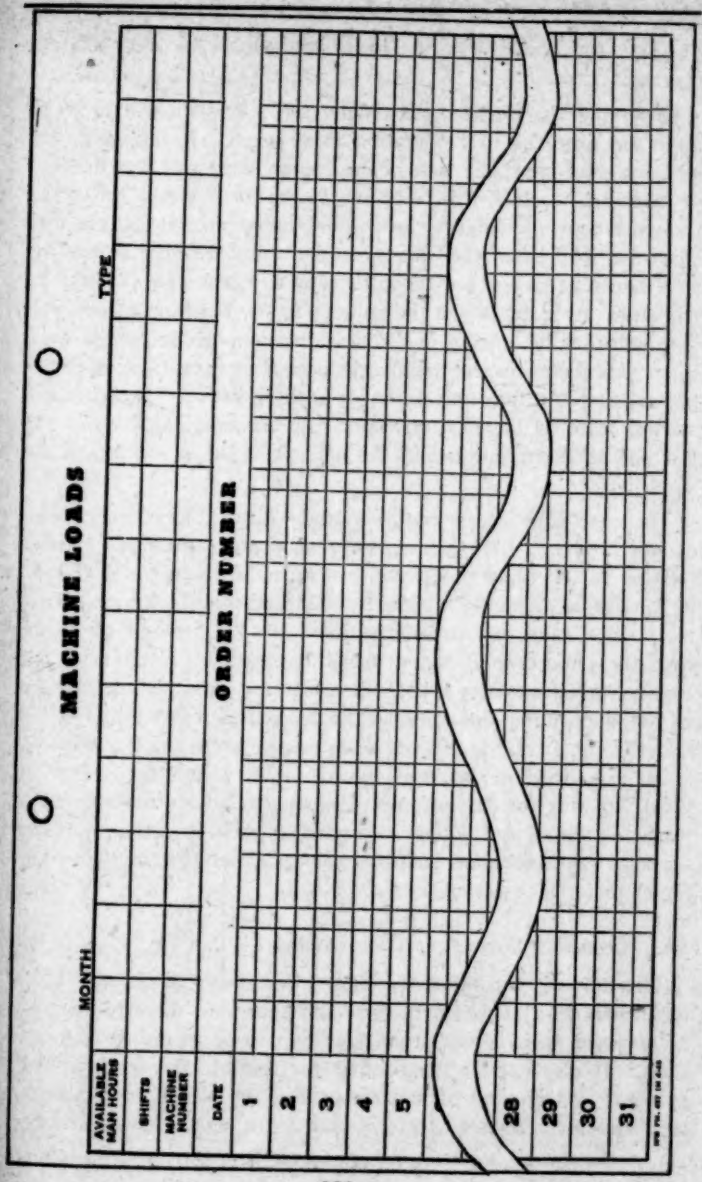
MACHINE LOADS
MONTH
TYPE
ORDER NUMBER
AVAILABLE MAN HOURS
SHIFTS
MACHINE NUMBER
DATE
1
2
3
4
5
28
29
30
31

EXHIBIT 4

Sundays and holidays of the month on which the shop will not operate.

Observing the desired stock date, the scheduler will approximate the time the first operation must begin. Referring to the machine load chart, he will determine on what day the machine or machines specified will be open. In the starting date column of the work copy (Exhibit 3) he will enter the date, and on the load chart he will enter the factory order number. By converting total hours as shown on the work copy to number work days, he will draw an arrow down the column to the finishing date. This date will then be entered in the finishing date column of the work copy. He then proceeds with each succeeding operation, establishing starting and finishing dates for each operation. The scheduled starting date of the first operation and the finishing date of the last operation are entered in the field provided at the top of the work copy.

The work copy is now complete, and a direct duplicating process master is typed. All the necessary shop and accounting records relating to this shop order are thus reproduced on cards 5" x 8" in dimension, each of a different distinguishing color and form title. The same information appears on the face of all cards, with the exception of the material requisition (Exhibit 5) and cost records (Exhibits 8-11) where certain areas are masked out in the duplicating operation. The field thus left vacant on the material requisition is laid out so as to record the daily and cumulative quantities of material issued. The vacant field on Cost Card No. 1 is for the purpose of posting tabulated monthly summaries of hours and dollars expended on each operation, opposite the total standard hours budgeted for each operation, and for posting of material costs on Cost Card No. 2.

Shop Travel Card and Inspection Record

The first white copy of the shop order shown at the top of the flow chart is a shop travel card and serves to identify each lot of material as it moves from operation to operation through the shop. It also carries the routing to facilitate the work of dispatching and moving of materials. For the benefit of the workmen and their foremen, information as to setup time allowances

ORIGINAL

MATERIAL REQUISITION

IRON FIREMAN MANUFACTURING COMPANY — CARD OF

PART NUMBER	PART NAME	CUST.	CONT. OR P. O. No.	PART NUMBER	FACTORY ORDER No.
USED ON ASS'Y QTY.	MATERIAL SIZE	SPECIFICATION	QTY. PER UNIT	DATE TO START / DATE TO COM.	QUAN. THIS ORDER
				QUAN. MAT'L. REQ'D.	LOT No. / QUAN. THIS LOT

OP'N. NO.	OPERATIONS—FOR DETAILS REFER ISSUE OF	MACH. OR DEPT. NO.	SET UP HOURS	PCS. PER HOUR	TOTAL HOURS	DELIVERED DATE	DELIVERED BY	DELIVERED TODAY	DELIVERED TO DATE
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
10					10				
11					11				
12					12				
13					13				
14					14				
15					15				
16					16				
17					17				
18					18				
19					19	PRICE			
20					20	EXTENSION			
21					21	ENT'D.—STORES ☐		COST ☐	

EXHIBIT 5

and the standard production rates per hour also appear on the travel card. As the order passes through each operation, inspectors stamp the card for operations which require inspection of the setup and the first piece produced.

The reverse side of this card is laid out in such a manner as to enable the recording of production from the first operation in order to establish the exact number of pieces put into production. This figure is important since it is used to provide complete accountability for finished parts and materials scrapped in process or final inspection. This card also becomes the inspection ticket when the parts are finally completed and inspected. It then becomes a posting medium for production control records and cost records. It frequently becomes necessary to send ahead or split a portion of an order so as to compress a schedule or overlap operations on urgently needed parts. In such cases, a travel card is provided for each lot, each card showing a consecutive lot number and number of pieces in each lot.

Shop Location Report

The second card on the chart is a shop order location report card. One card is reproduced for each operation listed on the shop order, plus one for a central location file. The purpose of this card is to furnish the planning department information as to the actual movement of an order from operation to operation through the shop. Information as to location and movement of every order in the shop is reflected in a central location file within a matter of hours, which is another very effective method of control and is described in detail elsewhere in this paper.

Material Requisition

The third card, original and duplicate, is the material requisition which specifies the standard amount of material required for the order (Exhibit 5). The original accompanies the order to the dispatch station in the shop, while the duplicate is retained in the material control section files until such time as the original has been filled and returned from the material storeroom, whereupon the original is posted to the material inventory records and cost records.

The travel cards, shop order location cards, and original material requisition are forwarded to the dispatch station, where they are inserted in a travel jacket and filed until the day previous to the scheduled starting date.

Foreman and Tool Crib Notification

The fourth card shown on the chart is a foreman and tool crib notification card. In reproducing this card, one card is furnished for each department through which the shop order is to pass, plus one each for the general shop foreman, tool crib, and timekeeping station. It is through this medium that each foreman is notified in advance of an order released to the shop. It also furnishes necessary information to the tool crib, enabling the crib attendants to prepare tools and assemble tool kits that will be necessary when the time comes to set up the individual operations on the order.

On the day previous to the starting date of an operation, the tool crib attendant will assemble all the necessary tools which are to be available the following morning. These will be picked up by a dispatch trucker, who will deliver the material and necessary tools to the new jobs to be set up during the day. The previously described operation instruction sheets which were furnished to the tool crib contain for each operation a list of the necessary jigs or fixtures and gauges usually identified by number or part number and operation number.

Inspection and Salvage Records

The next two cards on the chart are the inspection and salvage records. These are forwarded to the inspection and salvage department. This advance notice will enable the inspection department to organize its daily work program for routine process inspections and to furnish information as to the dates certain known critical operations will be running.

The reverse side of the inspection record (Exhibit 6) is designed to provide for the daily posting of individual inspections, showing date, lot number, daily and cumulative quantities received into inspection, quantities rejected, and quantities passed.

The reverse side of the second card issued to the inspection department is a salvage record (Exhibit 7) and is maintained in the salvage section of the inspection department. The purpose of this

DATE	LOT NO.	QUAN. RECEIVED		REJECTIONS		QUAN. PASSED		BY	DATE	TO ASSM. STORES		TO SHIPPING DEPT.		BY
		TODAY	TO DATE	TODAY	TO DATE	TODAY	TO DATE			TODAY	TO DATE	TODAY	TO DATE	

EXHIBIT 6—REVERSE SIDE OF INSPECTION RECORD

DATE	RECEIVED		PASSED		O.K. TO COMPLETE	REWORK	HOLD	ACCEPTED BY CUST. INSPECTORS	SCRAPPED	OP'N NO.	REMARKS
	MACH. INSP.	FINAL INSP.	FOR ASSEM.	FOR SHPMT.							

EXHIBIT 7—REVERSE SIDE OF SALVAGE RECORD

card is to provide complete accountability as to the source and disposition made of all rejected materials.

Cost Records

The last two cards shown on the chart are the cost records for the part. The reverse of one card (Exhibit 8) is used to record the quantities produced on the order, estimated or standard direct labor, and overhead costs in addition to the actual costs, and serves as a basis for determining cost variances by part and individual operations. The reverse side of the second card (Exhibit 9) receives postings for costs of material used from material requisitions previously described and also costs of purchased operations, if any, from vendors' invoices.

Location Report Cards

After an order has been released by the order writing section of the production control department to the dispatch station, the following procedure is used in releasing the order to the shop and its dispatch and follow-up through the shop operations to its completion.

In the morning of the day previous to the scheduled starting date of the first operation, a dispatch trucker will pick up the travel jacket containing all the cards and deliver it to material stores. Here the storeroom will withdraw from the jacket the original material requisition (Exhibit 5) and proceed to prepare the material for delivery to the first machining operation. Material may have to be cut into specified lengths before actual delivery to a machine. When this has been done, the dispatch trucker, having in the meantime picked up at the tool crib the necessary previously prepared kit of tools, such as jigs, fixtures, cutting tools, gauges, and operation instruction sheets, will pick up the material and deliver it to the specified department and machine. At this point, the dispatch trucker will remove one shop order location report card from the travel jacket and check off the first operation. The first operation called for usually reads, "Check and Deliver Material." He leaves a location card for this operation at a mail pickup box at the dispatch station. At the dispatch station, cards are immediately time-stamped by an electric time-recording clock which stamps the date and hour of the day the material was moved to the first operation.

PRODUCTION	MONTH												
	PUT IN PROCESS												
	SCRAPPED												
	FINISHED												
		UNIT		TOTAL		TOTAL		TOTAL		TOTAL		VARIANCE	
ESTIMATED	LABOR												
	OVERHEAD												
	MATERIAL												
	OUTSIDE WORK												
	SANDBLASTING AND PLATING												
	TOTAL												
ACTUAL	LABOR												
	OVERHEAD												
	MATERIAL												
	OUTSIDE WORK												
	SANDBLASTING AND PLATING												
	TOTAL												
VARIANCE													

REMARKS:

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EXHIBIT 8—REVERSE SIDE OF COST RECORD NO. 1

PURCHASED OPERATIONS

OPERATION NO.		VENDOR			OPERATION NO.		VENDOR			OPERATION NO.		VENDOR		
DATE	INV. NO.	QUAN.	UNIT COST	AMOUNT	DATE	INV. NO.	QUAN.	UNIT COST	AMOUNT	DATE	INV. NO.	QUAN.	UNIT COST	AMOUNT

EXHIBIT 9—REVERSE SIDE OF COST RECORD NO. 2

LIST OF CRITICAL SCHEDULES

EXHIBIT 9—REVERSE SIDE OF COST RECORD NO. 2

LIST OF CRITICAL SCHEDULES

DEPARTMENT PAGE 1 OF 1 DATE February 21, 19--

FACTORY ORDER NO.	LOT NO.	PART NUMBER	PART NAME	QUAN.	LAST REPORTED AT OPN NO.	LAST REPORTED AT DEPT. OR MACH. NO.	OVERDUE AT OPN NO.	OVERDUE AT DEPT. OR MACH. NO.	NO. OF DAYS OVERDUE 1	2	3	4	5	6	OVER 6	REMARKS AND FOREMAN'S REPORT
F2796		C 13	Pinion	100	70	17550	80	15780		L						
C6007		C 22	Nut	650	20	2220	30	17220			L					
G6470		R 314	Planet Gear	150	100	24500	110	2300						L		
K6542		R 336	Planet Gear	5500	60	2500	80	2300		G						
C5349		27A17	Frio. Carr. A.	125	30	18770	40	Insp			L					
B5297		260012	Rear P.T.O.Shaft	22	110	19410	120	1239			L					
C5320		26346	Sheave	500	50	18500	60	Insp			L					
A5345		H 36158	P.T.O. Shaft	170	100	15240	110	19410		L						
B7391		16153	Gear Case Tube	2500	30	19500	40	1728		L						
A7386		16156	Worm Shaft	570	70	2500	90	Insp							L7	
A7403		16170	Shea. Pin Gear	1100	30	1616	40	17910	L							
A7387		16172	Pinion Gear	2600	30	12210	40	2421	L							

EXHIBIT 10

LIST OF
CRITICAL COSTS AND PERFORMANCES

DATE
PAGE OF
DEPT.

	FACTORY ORDER NO.	PART NUMBER	PART NAME	QUAN. ON ORDER	OPER. NO.	ORIG. EST. ACCT. NO.	$	PCS. COMPLETED TO DATE TOTAL	PCS. COMPLETED TO DATE THIS MONTH	EST. % COMPLETED TO DATE	TOTAL EST. COST TO COMPLETE	TOTAL EST. COMPLETED COST	EXCESS OF ESTIMATED OVER EST.	FOREMAN'S REPORT AND REASONS OF CONDITIONS
1	F 6102	G 2	Gears	309	20	1932	1	71	15.8	20	$12.42	$35.71	$ 3.33	
2														
3	H 6103	G 3	Spider	237	120	1735	1	36	12.0	20	6.30	10.50	4.20	
4														
5	H 6103	G 3	Spider	237	100	771000	1	179	59.7	120	5.21	10.50	5.29	
6														
7	H 5161	H 36014	Outer Press	300	40	1787	1	36	4.6	12	10.50	27.50	16.90	
8														
9	B 7397	16175	Sheave	5644	40	1850	1	82	10.3	15	19.14	28.00	8.86	
10														
11	A 7401	16165	Sheave Pin Gear	525	30	1840	1	124	15.5	25	17.36	28.00	10.64	
12														
13	B 5774	256 G 33	P.T.O. Shaft	225	80	1837	1	25	3.1	5	17.50	28.00	10.50	
14														
15	F 5029	G 95	Jack Shaft	325	20	2025	1	63	11.9	16	18.16	24.50	6.34	
16														
17														
18														$65.06
19														
20														
21														

EXHIBIT 11

When this has been done, the cards are forwarded to the central location file clerk in the production control department. Here the date is posted to the master location card, on which will be posted the successive movements of material to all operations of the order. As the job progresses to each succeeding operation, a shop order location report card is similarly removed from the travel jacket and is time-stamped at the dispatch station and forwarded to the central location file.

List of Critical Schedules

The central location file is examined daily to determine which orders were to have been moved to new locations on the previous day as determined by the scheduled starting date given for each operation. If a location report card fails to come in reporting the movement of material by the scheduled starting date of the operation, the order is listed as critical from a schedule standpoint (Exhibit 10). This listing of overdue starting dates shows the following information:

1. Factory order number.
2. Part number and name.
3. Quantity on order.
4. Operation number and department or machine number at which the material was last reported.
5. Operation number, department, or machine number at which material is overdue.
6. Number of days overdue.

Copies of this list are reproduced in the necessary quantities and distributed to all individuals who are directly or indirectly concerned with the performance of schedules. They are distributed to all production foremen to notify them of the critical status of certain orders. Each foreman is required to report to the production superintendent concerning all jobs and operations listed as overdue and which were last reported in his department. He is required to make an investigation to determine whatever production difficulties may exist which can and should be corrected immediately and report these conditions promptly to the production superintendent. In this way, it is possible to take whatever corrective measures may be necessary in order to restore the operation to schedule in sufficient time.

Exhibit 11

This is one feature of production control that is very valuable in the maintenance of assembly schedules. The daily list of critical schedules in this manner enables us to detect immediately interruptions of production and to follow them back up the line for correction. Such interruptions might otherwise remain undetected and later shut down an assembly line for lack of one or two parts that may have been trailing behind in the parts fabrication schedule.

List of Critical Costs

The next important feature in the control of production is the immediate detection of operations which are being performed in a critical cost range. During each shift, as individual job cards are turned in to the timekeeping station, a clerk will refer to the timekeeping department's file of notification cards to determine the standard rate of production for the operation being performed. If the actual rate of production as determined by the number of pieces actually produced and the time expended by the operator does not come to, or falls below, a predetemined percentage of the standard performance rate, the operation becomes critical from a cost standpoint. A review of all time tickets is made in this manner, and in such cases where performance has been critical during the shift, the job is listed on a daily list of critical costs (Exhibit 11). This list by departments shows the following information:

1. Factory order number.
2. Part number and name.
3. Quantity on order.
4. Operation number.
5. Department or machine number and shift.
6. Total actual pieces completed and the actual rate per hour.
7. Next to the column "rate per hour" or "pieces per hour" is shown the standard or predetermined number of pieces per hour.

Since there is a natural tendency in most shops to be more dollar conscious than time conscious, we express the total standard or estimated cost of the work actually completed and also the total actual expended cost in dollar values at standard machine-hour rates. The difference or excess of expended over standard cost

tells us just how much money has gone down the drain during the shift. Totals are kept separate by departments and shifts, and in a manner similar to the list of critical schedules, department foremen are required to report to the production superintendent all conditions pertaining to jobs in their respective departments which have been so listed and to analyze and report their findings along with suggestions as to what might be done to remedy the situation.

Frequently, conditions arise which are beyond the control of the operator, and it is for this reason that no reference is made to the operator when the cost has risen to a critical point. It is up to the foreman, however, to be thoroughly familiar with the work going on in his department, and to know daily how efficiently the work is being performed. Instead of burdening the foreman and other department supervisors with lengthy production reports by applying the principle of exceptions, the report calls his attention only to those items which are out of line with our production plans and schedules.

This is perhaps one of the most important control measures we have adopted in our factories. We keep a day-to-day chart; in fact, we call it a "fever" chart, to which is posted daily the total number of items appearing on critical schedules and also the daily total excess cost in dollars. This has turned out to be a very interesting chart, because it shows the first early symptoms, which at times are difficult to detect otherwise, of approaching or increasing difficulties in the shop, both with respect to efficiency by which schedules are being followed and costs kept under control.

Summary

The purpose of the procedures we have just described has been to obtain the highest possible degree of efficiency by manufacturing the required quantity of product, of the required quality, at the required time, and by the best and cheapest method.

The principles we are applying throughout these planning and control procedures are aptly described by Frederick W. Taylor, who is today often referred to as the father of scientific industrial management as well as Alford in *Laws of Management Applied to Manufacturing:*

> "In the shop, the mental labor of production can be reduced by planning before the work is started, that is to say, *what* work is to be done; *how* the work is to be done; *where* the work is to be done; and *when* the work is to be done. Planning can finally be said to be the technique of foreseeing or picturing ahead every step in a long series of operations, each such operation to be of maximum efficiency, and so indicating each step in such a manner so that routine arrangements and release of orders will suffice to put the plan into action in the right place and at the right time."

The use of the tools of production control, as well as cost control and budgetary control, when properly applied has become what might be called a true art and science. By controlling causes, we control effects. When we can control effects, we can predict a result. When we have done this, we have created a new science in modern industry and management. As a matter of fact, modern management has been defined as the art and science of preparing, organizing, and directing human effort applied to control the forces and to utilize the materials of nature for the benefit of mankind.

A SIMPLE FORMULA FOR THE ACCRUAL OF THE VACATION PAY

By C. W. Bendel, Budgets and Statistics Supervisor, Jacobs Aircraft Engine Co., Pottstown, Pa.

AMONG the many problems created by the acquiescence of management to the demands of labor is the provision for the payment of vacation wages to all classes of employees. Under these conditions it is imperative that a workable means of accumulating the necessary funds for the payment of large sums, in the form of vacation wages, be adopted. In the old days, when only the clerical and supervisory employees received a paid vacation, it was possible to charge off vacation wages, when paid, without materially affecting the profit and loss statement. The vacation period was spread out over the summer months; the workers divided the work of those on vacation among themselves, and since these employees were normally indirect employees, it was not necessary to increase the amount charged to overhead.

There are several concepts of the categories into which vacation wages can be placed. The first considers such payments as a bonus to be applied against the profits of the business; the second classifies vacation wages as an item of overhead to be included in the computation of overhead rates. If they are placed in the first category, it must be assumed that lack of profits would indicate the discontinuation of the payment of vacation wages, thereby creating labor difficulties which would be undesirable. On the other hand, the classification of vacation wages as overhead necessarily increases the overhead rates with its attendant increase in the unit cost of the manufactured product. Since the selling price is supposedly based on the anticipated cost of the commodity, it would seem that this method would be the more desirable. It is not the purpose of this article to advocate the adoption of either method, but to elaborate on a vacation wage accrual procedure which will apply to both methods and, with some adjustments, be practical for most businesses.

An Illustration

For the purpose of illustration we will assume that the following conditions prevail:

1. The fiscal year begins January 1.
2. The vacation year begins July 1; all vacation wages are paid as of that date.
3. All employees, factory and office, on the payroll January 1 will receive one week's paid vacation.
4. All supervisory and office employees on the payroll the previous first of July will receive two weeks' paid vacation.
5. Vacation wages are based on a forty-hour week.

In addition to the above requirements, it is management's desire to avoid the appearance of any adverse balances in the accrual accounts; in other words, it is expected that the accrual account will be closed with the payment of the vacation pay on July 1 and that subsequent accruals will be applied against the vacation payments for the following year. Variances will be charged off to profit and loss as an adjustment.

The first phase in the solution to the problem of providing a simple, adequate, and practical method of determining the amount to be charged to the vacation pay accrual account each month consisted of the classification of the employees.

Classification of Employees

Two classes are provided automatically in items 3 and 4 above; however, in view of the fact that all employees on the payroll January 1 are entitled to vacation pay, it is necessary to provide additional categories in order that the proper amount may be accumulated during tthe first six months of the year. Employees are placed in the following numbered classes:

22. Office and supervisory employees on the payroll prior to July 1 entitled to two weeks' vacation.
12. Factory and other employees, entitled to one week's vacation, hired prior to July 31.
11. Factory and other employees, entitled to one week's vacation, hired prior to August 31.
10. Factory and other employees, entitled to one week's vacation, hired prior to September 30.
9. Factory and other employees, entitled to one week's vacation, hired prior to October 31.
8. Factory and other employees, entitled to one week's vacation, hired prior to November 30.
7. Factory and other employees, entitled to one week's vacation, hired prior to December 31.

Although the values for each classification will not change, it will be necessary to reclassify all employees at the end of the vacation year and change the basis or accrual allowance for each one to conform to his new status.

Preparation of the Table

The next phase consisted of the preparation of a table (Exhibit 1) that could be used to determine the vacation pay accrual for each department every month. The first three columns of this table are used to indicate an employee's earnings per hour, per week, or per month; the remaining columns indicate the amount of vacation wages to be accrued in each classification in

order that sufficient funds may be available July 1. The hourly rates require different scales. The weekly earnings column represents the employee's earnings for the regular forty-hour week. The monthly earnings column indicates the average monthly earnings at each wage level; these values are obtained by multiplying the weekly earnings by four and one-third weeks. The values for the classifications column are obtained by multiplying the monthly earnings by the percentages at the top of the table. The percentages in the line at the top of the table indicate the percentage of the monthly wage to be set aside for vacation pay; these are found by dividing the amount of vacation wages to be paid at a given wage level by the number of months remaining in the vacation year; the result is in turn divided by the monthly earnings to obtain the percentage of monthly earnings to be accrued.

Providing for Terminations and Wage Taxes

There are two additional factors to be considered before a plan of this kind can be put into operation. The first, that of providing for the Social Security and Unemployment Taxes on accrued vacation wages, offers no particular difficulty. It is a matter of opinion whether these taxes, being a relatively small amount which should affect the operating statements very little, should be charged off as paid, or whether the vacation wage accrual account should also contain a provision for the payment of these taxes. If this plan is selected, it is possible to charge the amount to the vacation wage accrual account by adding the proper percentage of the accrued vacation wages. The second problem is a bit more difficult since it concerns the labor turnover; a study of the company's labor statistics is required before the compensation factor can be introduced. Remember that all new personnel hired is accounted for by the use of the various classifications; therefore, the primary difficulty concerns the amount to be deducted from the vacation wage accruals to cover normal loss of personnel. Ninety-five per cent has been used as the compensating factor in this illustration on the assumption that 5 per cent of the employees eligible for a paid vacation will not be on the payroll as of July 1. Abnormal decreases in personnel, due to production

MONTHLY VACATION PAY ACCRUAL TABLE

Rate per Hour	Wages per Week	Wages per Month	22	12	11	10	9	8	7
			3.84%	1.92%	2.10%	2.31%	2.56%	2.89%	3.30%
$ .50	$20.00	$86.60	$3.33	$1.67	$1.82	$2.00	$2.22	$2.50	$2.86
.55	22.00	95.26	3.66	1.83	2.00	2.20	2.44	2.75	3.14
.60	24.00	103.92	3.99	2.00	2.18	2.40	2.66	3.00	3.42
.65	26.00	112.58	4.32	2.16	2.36	2.60	2.88	3.25	3.70
.70	28.00	121.24	4.66	2.33	2.54	2.80	3.10	3.50	4.00
.75	30.00	129.90	4.99	2.50	2.72	3.00	3.32	3.75	4.28
.80	32.00	138.56	5.32	2.66	2.90	3.20	3.54	4.00	4.56
.85	34.00	147.22	5.65	2.83	3.09	3.40	3.76	4.25	4.85
.90	36.00	155.88	5.99	3.00	3.27	3.60	3.98	4.50	5.14
.95	38.00	164.54	6.32	3.16	3.45	3.80	4.21	4.76	5.43
1.00	40.00	173.20	6.65	3.33	3.63	4.00	4.43	5.01	5.71
1.05	42.00	181.86	6.99	3.50	3.81	4.20	4.65	5.26	6.00
1.10	44.00	190.52	7.32	3.66	4.00	4.40	4.89	5.51	6.28
1.15	46.00	199.18	7.65	3.83	4.18	4.60	5.11	5.76	6.57
1.20	48.00	207.84	7.99	4.00	4.36	4.80	5.32	6.01	6.86
1.25	50.00	216.50	8.31	4.16	4.54	5.00	5.54	6.26	7.14
1.30	52.00	225.16	8.64	4.32	4.72	5.20	5.76	6.51	7.43
1.35	54.00	233.82	8.97	4.49	4.90	5.40	5.98	6.77	7.72
1.40	56.00	242.48	9.31	4.66	5.09	5.60	6.20	7.02	8.00
1.45	58.00	251.14	9.64	4.82	5.27	5.80	6.43	7.26	8.29
1.50	60.00	259.80	9.97	4.98	5.45	6.00	6.65	7.51	8.57

EXHIBIT 1

lay-off, etc., require special handling. Previous accruals should be scrutinized, and the excessive loss in eligible personnel should be considered in preparing an entry to profit and loss account.

Computing the Vacation Pay Accrued

The computation of the monthly departmental vacation pay to be accrued presents no difficulty. Two columns are added to the manually prepared record of individual payroll earnings and deductions (Exhibit 2) in which the vacation code and the vacation wage accrued are entered. Vacation wages are accrued on the employees on the payroll as of the last day of the last full week of the month; the vacation wage code is entered from an employee's master card, containing his hourly rate, social security number, etc. After all employees are coded (Note: a zero is used to indicate those who are not entitled to paid vacations), the payroll clerk turns to his table to complete the computations. First the rate is matched with the values entered in the rate column of the table; then the line is followed across until the code column is reached; the value entered in that column is transferred to the vacation wage accrued column on the payroll sheet. The total vacation wages accrued for each department are reported to the general ledger accountant, who multiplies this value by his compensating factor, 95 per cent, adds the social security and unemployment taxes, found by multiplying the accrued wages by the percentage required, and prepares his journal entry.

Conclusion

This method will not apply to all businesses, but it is simple, the tables are easy to prepare and use, and the results are reasonably accurate if the compensating factor is properly calculated. The vacation wages are charged during the month in which they are earned, thereby reflecting a true condition on the profit and loss statement and affording a means of including this type of expense in the unit cost of the product. Variations can be prepared to meet the requirements of almost any business. Although it is designed for use with manually prepared payroll records, it can probably be adapted to machine payroll accounting very easily.

PAYROLL EARNINGS AND DEDUCTIONS

Payroll Period Beginning Payroll Period Ending

Department Number Department Name

Clock Number	Name	Rate	M	T	W	T	Vacation Code	Vacation Wage
10-001	A Adams	.50					12	1.67
10-002	B Bowers	.55					12	1.83
10-003	C Clown	.60					22	3.99
10-004	D Dayse	.65					12	2.16
10-005	E Eames	.70					12	2.73
10-006	F Flowers	.75					11	2.72
10-007	G Glover	.80					22	5.32
10-008	H Harris	.85					10	3.40
10-009	J Jones	.90					9	3.98
10-010	K Karl	.95					8	4.76
10-011	L Lord	1.00					8	5.01
10-012	M Mason	1.05					7	6.00
10-014	N Norris	1.10					12	3.66
10-015	O. Good	1.15					12	3.83
10-017	A. Harrison	1.20					11	4.36
10-018	K. Carlson	1.25					11	4.54
10-021	S. Salmon	1.30					10	5.20
10-022	K. Killian	1.35					10	5.40
10-024	M. Miller	1.40					9	6.20
10-026	L. Larsen	1.45					8	7.26
10-028	O. Oder	1.50					0	.00
10-031	W. Wilson	1.50					7	8.67
10-035	R. Riste	.50					12	1.67
	Total							

Compensating Factor 95%

OAB and Wage Tax 2.3%

EXHIBIT 2

OUR OPEN FORUM

Combining Job Order and Standard Costs

Editor, N. A. C. A. Bulletin:

The April 1 *Bulletin* with four articles on standard costs does in twenty-five pages what many textbooks fail to do in three hundred. Each of the papers covers the subject matter logically and adequately in concise, simple language and, in my opinion, the *Bulletin* is a complete course of study in standard costs, capsule form.

In Cyril F. Gamber's paper entitled "The Relationship Between Standard and Actual Costs," he says that the use of standard costs does not preclude obtaining actual costs. He states that "variances are applied to reflect actual costs in inventory accounts which may be broken down by product lines in appropriate groups." True, this method will give you actual costs, but only by applying variances on broad product lines to individual items of product within the line.

There are many businesses which are confronted with a situation where neither standard nor job costs, separately, are satisfactory because of interchangeable parts crossing product lines, varying volumes because of changing customer requirements, parts sales being a substantial factor in sales volume, and a sheer multiplicity of variations in the end product itself. Isn't it likely that the answer lies in a combination of both standard and job costs working together? The question that is yet to be answered satisfactorily by the proponents of standard costs is how to obtain actual unit costs of parts, subassemblies, and finished products under such conditions. Whether the need for actual costs is real or imaginary is beside the point.

Mr. Gamber also states that under the job cost system, "a *great amount* of detailed work and duplication of effort is involved in collecting and distributing costs to work orders." This does not necessarily hold. Why can't a standard and job cost system go hand in hand to produce more effective control and satisfactory actual unit costs and yet not be prohibitively costly?

In the case of parts and subassemblies made for stock, order numbers can be a combination of the part number and a lot number so that a simple weekly sort and filing of job tickets, priced requisitions, and finished stores entry records can be made by "order number" and run for a net variance upon completion of the orders. In this way variances resulting from unreported scrap, material usage, missed operations, changed standard unit costs, etc., frequently "lost in the shuffle" in picking up variances currently, are automatically accounted for and not allowed to remain in the work-in-process accounts until the end of the year when an inventory is priced.

Under a plan wherein known variances against the current standard (processing changes reflected in unit costs on an up-to-date basis) are

developed from day to day and written out of work-in-process but not out of the cost of the order, and variances which elude us are washed out upon completion of each job, isn't it conceivable that work-in-process inventories may be sufficiently accurate for balance sheet purposes to obviate the necessity of a physical inventory?

MORRIS KLEIN, *Hartford Chapter.*

BUSINESS INDICES AND COMPANY SALES FORECASTS

Editor, N. A. C. A. Bulletin:

The use of indices for the purposes of measuring sales department efficiency and for forecasting sales income as advocated by Stanley Z. Bronner in his thought-provoking article, "Use of Sales and Production Forecasts in the Determination of Variances" in the March 15, 1946, issue of the *Bulletin,* is especially interesting to the writer. He wishes that Mr. Bronner had devoted more space to the problems involved in selecting the appropriate indicator and in its use. For example, one of the dangers is the adoption of an index before its correlation with the product sales history is conclusively proved. A consideration in establishing this reciprocity is the period to be covered by the test which in the writer's opinion should be extended at least through a whole business cycle. (This may also be desirable for the purpose of developing the long-time growth trend.) The consistency of the correlation must be established and any important deviations fully investigated. In some cases it may even be necessary to consult the compilers of the index to determine the cause of any material deviations as well as to examine the particular segment of the company history involved. In passing, it is to be noted that the best index for the stated purposes is the one whose movements precede the corresponding changes in the sales under review.

For some companies, no single index is available with which the sales may be correlated. In such cases one must be developed by a combination of two or more indices. The development of the combined index frequently involves problems requiring outside consultants. In some instances it is necessary to use different indices for the same or similar products sold at different price levels. One index might be used for luxury items, whereas another might be required for lower-priced models. Good examples of such products are the different lines and models in the automobile business.

Before an index is finally selected, its factors and the relative weight given to each should be obtained and considered in relation to the product's markets. Knowledge of the factors will assist also in the intelligent use of the indicator for measuring sales department performances. It would be wise to find out at the same time whether any changes in the computation of the index are contemplated and the effect of any proposed changes.

In evaluating the sales department's efforts by the employment of indices, care should be taken to consider unusual transitory changes in economic conditions which are reflected in the index, but may not significantly affect the sales of the company's products or whose influence on its markets may

be delayed beyond the normal time lag. The effect of the recent steel strike is a case in point. It was reflected in practically all indices but did not effect equally all companies' sales. Such transitory abnormal events may occur more frequently in the immediate postwar period than in other times. Of course to have any significant effect, such unusual forces must be of great magnitude.

These examples are given to illustrate some of the problems involved and to show that the use of indices requires considerable hard thinking and study. But the rewards are well worth the time, money, and effort expended. Certainly the use of indices for forecasting sales and measuring selling efficiency is an intelligent and constructive approach to the problem of eliminating or minimizing the human element and guesswork so often found in the usual treatment of this problem.

The use of indices for measuring sales department performance and forecasting is not limited to large producers. Many smaller concerns can successfully use this means of estimating future sales. Nor is the use of the method limited to concerns having national distribution, for many local, state, and federal agencies provide indices for local districts.

GEORGE A. BRICAULT, *New York Chapter.*

Editor, N. A. C. A. Bulletin:

In H. G. Peterson, Jr.'s, discussion, "The Coordination of Company Financial Planning With External Economic Conditions," published in the March 1, 1946, *Bulletin*, the methods of developing analyses of forecasted sales and costs from market survey figures are thoroughly covered. So also are the advantages resulting from their use. But the market analysis, which is the basis for all subsequent sales and cost forecasts, analyses, and planning can well bear somewhat more detailed consideration, especially in these uncertain times.

It is of prime importance that the time-lag factor be recognized. The market analysis gives data on the market as it is when the survey is made, but the sales being forecasted must be made in the market as it will be several months to a year later. Before the survey figures can be used, they must be reviewed and modified in the light of probable market changes during this time-lag. The general labor situation in the market area is highly significant, as strikes can very quickly and materially affect both the quality and the quantity of sales through reduction of purchasing power. Currently, population shifts are having their effect as certain sections decline from their war-swollen totals and others gain. Co-existent with such moves are changes in the composition of a market with respect to shifts in proportions of the various income groups and in the types of demand. Soundness of an area's industrial and agricultural activity and the extent of seasonal or irregular employment have a considerable bearing on earnings and, consequently, on buying power. These are representative of the many factors which may cause major changes in a market. Use of market-survey figures without considering them is building the whole forecasting structure on a questionable base.

One more point might be made concerning the long-range evaluation of a market potential when planning sales. Most of Mr. Peterson's comments concerning the effect on profits of increased fixed costs, resulting from adding another model in the same price bracket, apply also to an increase in the production facilities for any one model. In both instances a permanent increase in the market, or at least in the company's share of it, is necessary to cover the additional costs. Consequently, before expanding facilities to gather in all of "your share" of the current market, the basis of the current demand and its probable duration should be determined. Otherwise a belated discovery that the market was abnormal may find the company saddled with unjustified fixed costs in the face of declining sales. The subnormal profits, resulting from either absorbing idle equipment costs or engaging in a costly sales effort to maintain volume by attempting to capture and keep a larger than normal portion of the insecure "floating" market, is a costly penalty.

ROBERT W. GRIM, *Toledo Chapter.*

TAKING THE PHYSICAL INVENTORY

Editor, N. A. C. A. Bulletin:

In the December 1, 1945, *Bulletin* there is what I believe to be as fine and complete an article on the taking of physical inventories as has been published for some time. It covers each step of the work very carefully and will fit into most industrial organizations. Any concern with inventories in more than one location must follow each of these steps. Unless the procedure is carefully outlined in instruction form, the inventory may be taken in a haphazard manner resulting in error, in a difficulty in reconciliation, and possibly in the distortion of the financial reports.

I believe these instructions should remain unchanged from year to year to the extent possible and should be published in printed form so that two or three meetings may be held before the date scheduled for taking the inventory. It might be desirable to follow the same program each time in order that the danger of omitting to report outstanding receipts, disbursements, vendors' charges, etc., might be lessened.

As a further recommendation, I suggest that the stock bins on voluminous and fast-moving items be marked with graduations on the outside so that cubic content can be established simply by leveling off the material in the bin at a particular point. This cubic content can then be interpreted into units by the use of previously prepared charts or tables. This information could also be printed on the bin card in order that it may be readily available to the counter without the use of the chart.

On the larger size items, another method of counting is to place a marker in the form of a wire or rope at certain levels. When stocks reach this marker it automatically establishes an actual count for all stock below the marker, therefore, it is only necessary to count or measure the articles above the marker when a physical inventory is taken.

R. A. HART, *Providence Chapter.*

The Factory Accountant's Place in Management

Editor, N. A. C. A. Bulletin:

The article by Christian E. Jarchow on "The Factory Accountant's Place in Management" appearing in the February 15 *Bulletin* certainly is a comprehensive picture of the role of the factory accountant in management. However, we know that in many cases the factory accountant is, if not "relegated to the role of keeper of the archives" as mentioned by the editor, at least not considered with as high a regard as indicated by the article. Mr. Jarchow points out the factor which seems to me to cause the difference between the possible role and that which is attained by many accountants when he says, "Furthermore he (the factory accountant) should be able to interpret that information to management clearly and tactfully in an operating man's language." While further emphasis of the point may seem repetitious, still it occurred again and again to me as I read the article.

A newspaper man spends a great deal of effort on the headline, an author or song writer on the title, or an advertising man on the "punch line," but too often an accountant makes no effort to attract attention to his report. Before any interpretation can be made to management, it is necessary to secure management's attention, attention which is being sought by many other imperative problems. It would seem far from a waste of time for an accountant to make a real effort to learn the necessary salesmanship to attract the attention of his management.

To secure attention to a report, while often the major step, is not all that is necessary. A report must tell its story concisely in language the reader understands. While it may not be textbook accounting, it is often common sense to express your results and conclusions in words with a few simple figures.

Finally, when a report is presented in which a situation is pointed out, a recommendation should be made as to correction. It is true that the correction is often a management problem, not an accounting problem; but in nearly all cases, if management is to take action, the action must be considered before the report is laid down and attention is drawn to another problem. The accountant, knowing the financial results which will follow, should be able to make some recommendation. The specific correction recommended may not be adopted, but at least it will give management a starting point for thinking about the problem and will be much more effective than a simple exposé of the situation.

George R. White, *Toledo Chapter.*

NOTICE OF ANNUAL MEETING

Notice is hereby given to all members of the Association that the Annual Meeting of the National Association of Cost Accountants will be held at the Waldorf-Astoria Hotel in New York, New York, on Tuesday, the 18th day of June, 1946, at 11.30 a.m. (DST), to receive the report of the Nominating Committee and to transact such other business as may properly come before the meeting.

REPORT OF THE NOMINATING COMMITTEE

To the Members of the National Association of Cost Accountants:

Pursuant to the provisions of Article VII, Section 1, of the By-Laws of the Association, the Nominating Committee submits the names of nominees for the several vacancies in the offices and directorships of the Association and for the Nominating Committee for the fiscal year beginning September 1, 1946, to be filled at the Annual Meeting in New York on Tuesday, June 18, 1946.

In making these nominations, the importance to the Association of a Board of actively participating members and the desirability of adequate representation of every section of the Association have each received thoughtful consideration. The task of the Committee has been made at once easier and more difficult by the availability of many able and experienced men throughout our chapters.

Each year a considerable group of men complete with enviable records their terms as officers and directors. In the face of a need for continuously introducing new faces and points of view into the management of the Association it is not possible to renominate more than a fraction of them. Retiring officers and directors go into an active reserve from which the Association always can, and frequently does, draw as the need for experience arises.

Your Committee is confident that these nominees, together with those who will continue in office, will assure continued able administration of N. A. C. A. affairs.

The slate follows:

President, WILLIAM J. CARTER, Atlanta, Georgia
Vice President, CLINTON W. BENNETT, Boston, Massachusetts
Vice President, WILLIAM A. BOYLE, Syracuse, New York
Vice President, WILLIAM E. PERRY, Scranton, Pennsylvania
Vice President, CHARLES REITELL, New York, New York
Treasurer, PHILIP J. WARNER, New York, New York

Directors to Serve Three Years

WILLIAM Y. ARMSTRONG, Cleveland, Ohio
THOMAS A. DUNBAR, Boston, Massachusetts
WILLIAM H. FRANKLIN, Peoria, Illinois
EDWIN W. HART, Philadelphia, Pennsylvania

J. B. Inglis, New York, New York
Jesse G. Kline, Philadelphia, Pennsylvania
John W. Schlosser, East St. Louis, Illinois
Harold W. Scott, Detroit, Michigan

Directors to Serve One Year

James L. Brownlee, Homewood, Alabama
William H. Churchill, Washington, D. C.
Hugh G. Davis, Honolulu, T. H.
James F. Doherty, Providence, Rhode Island
Francis H. Hall, Ansonia, Connecticut
George E. Hallett, East Orange, New Jersey
Paul H. Hartmann, Fort Wayne, Indiana
Arthur J. Keller, Akron, Ohio
Charles E. Rawlinson, Portland, Oregon
Paul G. Rohlfing, Dayton, Ohio
J. S. Seidman, New York, New York
Russell S. Willcox, Columbus, Ohio

Nominating Committee to Report in 1947

Frank Klein, Harrison, New Jersey, *Chairman*
William J. Carroll, West Haven, Connecticut
Erwin Heinen, Houston, Texas
E. H. Nowlin, San Francisco, California
Leonard E. Zastrow, Milwaukee, Wisconsin

Following are brief references to the service of the several nominees:

Mr. Carter is well known throughout the accounting profession. He joined the Association as a member of the Atlanta Chapter in 1930 and served his Chapter as Director of Publications in 1931-32; Secretary, 1932-33; Vice President, 1933-34; and as President for two terms, 1934-35 and 1935-36. Elected to the National Board for a one-year term in 1940-41, he was re-elected the following year. Elected Vice President of the Association for the current year, Mr. Carter has visited and addressed a large number of chapters and has made the presentation of charters to two new chapters of the N. A. C. A.—the Chattahoochee Valley and Piedmont Chapters. Mr. Carter, a native Georgian, will be the first N. A. C. A. President from the South. He is a C. P. A. of Georgia and New York and a Partner of the public accounting firm of Mount and Carter of Atlanta. In addition to his activities in N. A. C. A., Mr. Carter has served as President of the Georgia Society of C. P. A.'s, Director of the American Society of C. P. A.'s, Director of the Atlanta Chamber, National Councilor of the U. S. Chamber of Commerce, Chairman of the Georgia Board of Accountancy, and as a member of Committees of the American Institute of Accountants and of the Cooperative Investment Bankers. He has been a frequent speaker at meetings of accountants and

is co-author with William T. Sunley of *Corporation Accounting,* published by The Ronald Press Co.

Mr. Bennett joined the Association in 1920 as a member of Boston Chapter. He has served the Chapter as Director of Publications, 1935-36; Vice President, 1936-38; and as President, 1938-39. He has contributed a number of articles to the *N. A. C. A Bulletin* and has been a frequent speaker before chapter meetings. He addressed the 1922 Conference at Atlantic City, led the group discussion on "Inventories" at the Atlantic City Conference in 1939, addressed the St. Louis Conference in 1940, and was a member of the Technical Program Committee for our Boston Conference in 1943. Mr. Bennett was elected to a three-year directorship of the Association in 1943 and has served as Director in charge of Education, 1943-45, and as Director in charge of Chapters, 1945-46. In March, 1946, he was appointed Chairman of the Committee on Research to succeed Dr. Thomas H. Sanders. Mr. Bennett is a Partner of Cooley & Marvin, Boston, Massachusetts.

Mr. Boyle has been a member of the Association since 1924. He served the the Syracuse Chapter as Vice President for the years 1927-29 and as President for 1932-34. He was elected to a three-year directorship of the Association in 1937 and has served as Director in charge of Publicity, 1938-40. Having served as Vice President of the Spot Club in 1943-44, he has been serving as President since 1944. Mr. Boyle is Comptroller of the U. S. Hoffman Machinery Corp., Syracuse, New York.

Mr. Perry was first elected to the National Board in 1933 and served the Association as Director of Constitution during the last year of that term. He has been a member of the Association since 1928 and has served the Scranton Chapter as Director of Meetings, 1930-31; Vice President and Director of Program, 1931-32; President, 1932-33; and Member Attendance, 1935-36. He has contributed to the *Bulletin* and has been a frequent speaker before chapter meetings. He addressed our Chicago Conference in 1938, led the group discussion on "Cost Reports to Top and Sub Management" at the new York Conference in 1941, and was Chairman of the Technical Program Committee for the Chicago Conference in 1942. In 1933 Mr. Perry was elected to a three-year directorship of the Association and served as Director in charge of Constitution in 1935-36. In 1943 Mr. Perry was again elected to a three-year directorship of the Association and has served as Director in charge of Publications, 1943-46. Mr. Perry is Controller of The Scranton Lace Company, Scranton, Pennsylvania.

Dr. Reitell served as Director in charge of Meetings of the Pittsburgh Chapter in 1925-26, Vice President in 1926-27, and President in 1927-28. He was instrumental in the organization of the Harrisburg Chapter and served as its first President in 1931. After his election to the National Board in 1931, he served the Association as Director in charge of Education for 1931-34; in 1935 he was re-elected for another three-year term and served as Director in charge of Constitution for the year 1934-35; Director in charge of Lectures, 1935-36; and again as Director in charge of Educa-

tion, 1937-38. Dr. Reitell is a Participating Associate in the firm of Stevenson, Jordan & Harrison, Inc., New York, New York.

Mr. Warner joined the Association in October, 1919, as a charter member. He was elected to the National Board in 1925 and served as National Director in charge of Membership from 1925 to 1928, National Director in charge of Chapters in 1928-29, and National Director in charge of Constitution from 1929 to 1931. In 1933 he was elected Treasurer and has served in that capacity since that time. He was a member of the Finance Committee in 1932-33 and became Chairman on his election as Treasurer the following year. He served as Chairman of the Conference Technical Program Committee for the Detroit Conference in 1932. Mr. Warner is President of The Ronald Press Company, New York, New York, a Certified Public Accountant of New York, and a member of the American Institute of Accountants.

Mr. Armstrong is proposed for re-election. He originally joined the Association in 1929 as a member of Milwaukee Chapter. He later became a member of Cleveland Chapter. He was elected Director of Membership in 1939-40, Director of Publications in 1940-41, Vice President in 1941-43, and President in 1943-44. Mr. Armstrong has addressed several chapters and appeared on a panel at the Chicago Conference in 1944. He has also written for the *Bulletin*. He is completing a term as one-year director of the Association. Mr. Armstrong is District Manager of The American Appraisal Company in Cleveland, Ohio.

Mr. Dunbar joined the Association in 1928 as a member of the Boston Chapter and served the Chapter as Director of Publicity, 1930-31; Treasurer, 1931-33; Vice President, 1933-35; and President, 1935-36. He served as National Director in 1943-44. He has contributed to the *Bulletin* and has been a frequent speaker before chapter meetings. He was General Chairman of the Boston Conference in 1935, led a group discussion on "Requirements for Effective Internal Audit and Control" at the New York Conference in 1941, and was Financial Chairman of the National Conference in 1943. Mr. Dunbar is at present a member of the Committee on Research. He is Comptroller of Boston Elevated Railway Company, Boston, Massachusetts.

Mr. Franklin was elected to membership in the Association as a member of the Peoria Chapter in 1941. He served the Chapter as Director of Program, 1942-43; Vice President, 1943-44; and as President, 1944-45. He is serving as a member of the 1946 Technical Program Committee. Mr. Franklin has written several articles for the *Bulletin* and contributed to the 1945 *Year Book*. He is at present a member of the Committee on Research. Mr. Franklin is Controller of Caterpillar Tractor Co., Peoria, Illinois.

Mr. Hart joined the Association in 1921 as a charter member of the Philadelphia Chapter. In that Chapter he has held the offices of Director of Membership, 1938-40; Secretary, 1940-41; Vice President, 1941-43; and President, 1943-44. Professionally, Mr. Hart is a Certified Public Accountant and head of his own firm in Philadelphia, Pennsylvania.

Mr. Inglis is proposed for re-election. He has been a member of the

Association and affiliated with the New York Chapter since 1944. He is at present a member of the Committee on Research and is completing an unexpired term on the National Board created by a resignation. Mr. Inglis is a Partner in the firm of Price, Waterhouse & Co., New York, New York.

Mr. Kline is proposed for re-election. He joined the Association in 1937 as a member of Philadelphia Chapter. He served the Chapter as Director of Publicity, 1940-41; Director of Program, 1941-42; and President, 1942-43. He has contributed to the official *Bulletin* of the Association and has spoken many times before chapter meetings. Elected to the National Board as a three-year director in 1943, Mr. Kline has been Director in charge of Membership, 1943-45, and Director in charge of Education, 1945-46. He is Chief Cost Accountant of The Atlantic Refining Company, Philadelphia, Pennsylvania.

Mr. Schlosser joined the Association in 1933 as a member of the St. Louis Chapter. He has served that Chapter as Director of Publications, 1937-39; Vice President, 1939-40 and 1942-44; and President, 1944-45. Mr. Schlosser is Controller of the Geo. S. Mepham Corp., East St. Louis, Illinois.

Mr. Scott was elected a member of the Association in 1931. Since his election he has served the Detroit Chapter as Director of Publications, 1936-39; Program, 1939-40; Vice President, 1940-41; and President, 1941-42. Mr. Scott is at present a member of the Committee on Research. He is a Resident Partner of the firm of Haskins & Sells in Detroit, Michigan.

Mr. Brownlee joined the Association in 1935 as a member of the Birmingham Chapter. He has served the Chapter as Director of Program, 1937-38; Member Attendance, 1938-39; Vice President, 1939-41; and President, 1941-42. Mr. Brownlee is General Procedure Supervisor for the Tennessee Coal, Iron & R. R. Co., Birmingham, Alabama.

Mr. Churchill became a member of the Association in 1922 and was a charter member of the Washington Chapter in 1932. He served from 1932 to 1934 as Vice President and as President of the Chapter during 1934-35. Mr. Churchill is Treasurer and a member of the Executive Committee of the Peoples' Drug Stores, Inc., Washington, D. C.

Mr. Davis has been a member of the Association and of the Hawaii Chapter since 1929. His offices in that Chapter have been Director of Membership, 1930-31; Meetings, 1931-32; Member Attendance, 1932-33; Vice President, 1933-35; and President, 1935-36. Mr. Davis is Treasurer of the Honolulu Rapid Transit Co., Ltd., Honolulu, T. H.

Mr. Doherty has served the Providence Chapter as Director of Meetings, 1939-41; Vice President, 1941-43; and President, 1943-44. He became a member of the Association in 1935, at which time he affiliated with the Providence Chapter. Mr. Doherty is Secretary and Chief Cost Accountant of the American Screw Co., Providence, Rhode Island.

Mr. Hall was elected to membership in the Association in 1934 and has served the New Haven Chapter in the following offices: Director of Program, 1938-39; Treasurer, 1939-40; Vice President, 1940-42; and Presi-

dent, 1942-43. He is Comptroller of the Farrel-Birmingham Co., Ansonia, Connecticut.

Mr. Hallett, a member of the Association and of Newark Chapter since 1937, has held the following offices in Newark Chapter: Director of Employment, 1938-39; Program, 1939-40; Vice President, 1940-42; and President, 1942-43. He is a member of the 1946 Conference Committee. Mr. Hallett is President of the New Jersey Association of Credit Executives for 1945-46. He is Assistant Secretary and Assistant Treasurer of Tung-Sol Lamp Works, Inc., Newark, New Jersey.

Mr. Hartmann joined the Association in 1940 as a member of the Fort Wayne Chapter. He has been Director of Publications, 1941-42; Vice President, 1942-44; and President, 1944-45, of the Fort Wayne Chapter. Mr. Hartmann is Assistant Treasurer of the Farnsworth Television & Radio Corp., Fort Wayne, Indiana.

Mr. Keiler joined the Association in 1939 and is a member of the Akron Chapter. He served the Chapter as Director of Membership, 1943-44, and as President, 1944-45. Mr. Keiler is Comptroller of the R. H. Freitag Mfg. Co., Akron, Ohio.

Mr. Rawlinson, a member of the Portland Chapter, has held the following offices in that Chapter since his election to membership in the Association in 1938: Director of Membership, 1941-42; Vice President, 1942-45; and President, 1945-46. He is a Manager of the Portland office of Price, Waterhouse & Co., Portland, Oregon.

Mr. Rohlfing was elected to membership in the Association and Dayton Chapter in 1935. He has held many offices in that Chapter, namely, Director of Program, 1937-39; Membership, 1939-40; Employment, 1940-41; Treasurer, 1941-42; Vice President, 1942-44; President, 1944-45. Mr. Rohlfing is a Principal with Wall, Cassel & Eberly in Dayton, Ohio.

Mr. Seidman has been a member of the Association since 1934 and is a member of the New York Chapter. He served as Program Director of that Chapter for 1937-39 and again during 1940-41. Mr. Seidman is a Partner in the firm of Seidman & Seidman, New York, New York. At present he is serving as Chairman of the 1946 Conference Publicity Committee.

Mr. Willcox became a member of the Association in 1927 in Columbus Chapter. He has served that Chapter as Director of Publications, 1928-30, and President, 1933-34. He has contributed to the field of cost accounting literature through authorship of two books on the subject. Mr. Willcox is Professor of Accounting at Ohio State University, Columbus, Ohio.

Respectfully submitted,

Robert Burns
Harry A. Grube
Herbert Retzlaff
Harris Saunders
Martin A. Moore, *Chairman*

Victor H. Stempf

1893-1946

The accounting profession lost a beloved and accomplished leader in the passing on April 18 of Victor H. Stempf at the age of fifty-two. In addition to his many contributions to N. A. C. A., Mr. Stempf was equally active in other accounting associations. He served the American Institute of Accountants as President and as chairman and member of a large number of its committees. He served as President of the New York State Society of Certified Public Accountants, President of the Accountants Club of America, and Vice President of the American Accounting Association.

Born in Minneapolis, Mr. Stempf spent most of his early life in St. Louis where he graduated from the School of Commerce of St. Louis University in 1915. He entered the St. Louis office of Touche, Niven & Co. in that year, becoming Resident Manager and a few years later at the age of twenty-seven, a Junior Partner. In 1927 he transferred to the New York office of his firm as a Partner.

At its meeting on April 26 the Board of Directors of N. A. C. A. directed that the following resolution be inscribed upon its minutes:

> The Board of Directors of the National Association of Cost Accountants records with deep sorrow the passing of Victor H. Stempf.
>
> Victor Stempf served this Association notably in many capacities over more than twenty-five years. From 1935 until his death he was a member of the National Board of Directors. As a Director, Vice President, National President, and since 1944 as a member of the Executive Committee his untiring efforts on behalf of N. A. C. A. were a major factor in its growth and development. During his term as President he combined a tremendous program of inspiring visits to every one of our chapters with policy and administrative activities that produced a substantial advance in the Association's program. His seemingly limitless energies made possible, during the same period of service to N. A. C. A., equally great contributions to other professional associations in the field of public accounting. In everything he touched his leadership left its mark of progress.
>
> His friendliness and good counsel were unfailing and generously offered. His passing leaves a mighty void in our ranks. As his contribution and influence have been far-reaching, so his death is a personal loss to many.
>
> This Board acknowledges with humble appreciation its gratitude and that of this Association to Victor H. Stempf. It extends its deep sympathy to members of his family.

MARTIN A. MOORE ELECTED TO EXECUTIVE COMMITTEE

At the meeting of the National Board on April 26, Past President Martin A. Moore, Comptroller, Hyatt Bearings Division, General Motors Corporation, was elected a member of the Executive Committee of the Association to complete the term of Victor H. Stempf which expires on August 31, 1947. The other members of the Executive Committee are Past President Grant R. Lohnes, Treasurer of the National Cash Register Co., Dayton; William F. Marsh, Partner of Lybrand, Ross Bros. & Montgomery, Pittsburgh; and the national officers.

AN OUTSTANDING REGIONAL COST CONFERENCE

In every respect the Pennsylvania Regional Cost Conference held at the Yorktowne Hotel in York, Pennsylvania, on Saturday, April 6, was an outstanding success. A total of 380 persons registered for one or more of the conference related activities; 247 of them from the four sponsoring chapters—Harrisburg, Lancaster, Reading, and York. In all, 16 chapters were represented.

At the morning and afternoon technical sessions dealing with the Conference theme, "A Return to Cost Control," a large audience heard excellent talks by C. E. Headlee of Westinghouse Electric Corp., Jesse G. Kline of The Atlantic Refining Co., and E. J. Hanley of Allegheny Ludlum Steel Corp. pointing the way to improved cost control in the period ahead. At the luncheon meeting Warren Bulette, Past President of the Pennsylvania State Chamber of Commerce, explained to a large and appreciative audience why the opportunities of the industrial accountant in the postwar period will be greater than ever before. The Conference ended with a banquet and ball in the best N. A. C. A. tradition.

A Chapter Officers' Conference on the evening preceding the Conference, attended by 96 chapter officers and directors representing 13 N. A. C. A. chapters, provided an opportunity for a discussion of chapter operations and an interchange of experience.

To John Wiebenga of York, General Chairman; R. G. Houck and C. E. Humer of York, Co-Chairmen; M. L. Beck of York, Hotel Arrangements Chairman; J. G. Redman of York, Treasurer; Miss Kay Busser of York, Ladies Chairman; O. J. Swartz of Lancaster, Finance Chairman; I. W. Keller of Lancaster, Program Chairman; J. H. Hoag of Lancaster, Banquet Chairman; R. H. Chelius of Reading, Publicity Chairman; H. C. Sheets of Harrisburg, Registration Chairman; and the members of their committees goes a vote of thanks for the excellent job of planning and conducting this most constructive and inspiring regional conference.

CONFERENCE TECHNICAL PROGRAM

WALDORF-ASTORIA HOTEL, NEW YORK
JUNE 17, 18, AND 19, 1946

MONDAY MORNING, JUNE 17

Chairman: Horace G. Crockett, McKinsey & Co.

Influence of Volume on Costs and Prices
Speaker to be announced.

Helping the Sales Executive
William E. Jones, Vice President in charge of Sales, Scranton Lace Co.

MONDAY AFTERNOON, JUNE 17

Theme: Increasing the Industrial Accountant's Value
Chairman: Stuart D. MacLaren, Heywood-Wakefield Co.

Program for Improved Performance
Percy L. Proctor, Vice President, Titeflex Metal Hose Co.

Training People for the Job
Hugh J. Phillips, Jr., Director of Organization Planning, U. S. Steel Corp.

Making the Figures Talk
Frank Wallace, Principal, McKinsey & Co.

TUESDAY MORNING, JUNE 18

Theme: Putting Cost Accounting to Work
Chairman: Edward J. Hanley, Allegheny Ludlum Steel Corp.

For Cost Control
Verne Breitenbucker, Manager, Cost Department, Lockheed Aircraft Corp.

For Cost Reduction
L. Clayton Hill, Works Manager, Eagle Pencil Co.

TUESDAY AFTERNOON, JUNE 18

Theme: Putting Cost Accounting to Work (Continued)
Chairman: William H. Franklin, Caterpillar Tractor Co.

For Profit Determination and Inventory Valuation
Herbert T. McAnly, Partner, Ernst & Ernst.

To Answer the $64 Questions
Herman C. Heiser, Controller, Crown Can Co.

WEDNESDAY MORNING, JUNE 19

Chairman: James J. Hastings, James J. Hastings & Co.

Long-Term Profit Planning—Speaker to be announced.

Explaining Profits to Employees—Speaker to be announced.

N. A. C. A. BULLETIN

Vol. XXVII, No. 18 May 15, 1946

IN TWO SECTIONS

Section II

RESEARCH SERIES

No. 7

The Uses and Classifications of Costs

EDITORIAL DEPARTMENT NOTE

In any field of study as extensive as the field of cost accounting, research must of necessity involve individual projects, each dealing with a limited segment of the entire field. In a continuing program of research it becomes desirable to have a broad outline of the entire field and its various subdivisions to serve as the basis for the selection of specific areas for study and to assure that each subject be studied in proper relation to the field as a whole. It was with this objective in mind that the following paper on "The Uses and Classifications of Costs" was prepared for the use of the Committee on Research. It has been reviewed by the Committee and is being published in order that the concepts and relationships mentioned here may serve as a common ground between the Committee and the members of the Association in the discussion of subsequent problems.

It was at first contemplated having two of these preliminary papers, one on the uses of cost, and one on cost classifications or cost behavior. The early efforts to write two papers made it clear, however, that the two phases of the subject were so interwoven that they were the warp and weft of the same fabric. A single paper therefore was decided upon as a more natural presentation; but the reader will do well to note throughout the paper the two streams of ideas—cost uses and cost classifications—as they are developed and as they influence each other in producing cost results.

This paper is descriptive and factual. Where questions occur in the narrative they indicate the presence of problems which offer opportunity for future research work, but answers are not attempted here. We do not regard this paper as taking a position in cost accounting controversies, except the basic position that the best cost accounting is the most useful cost accounting, and that the most useful procedures for one purpose may not be the most useful for another purpose. Experience with the discussions of cost accountants in chapter meetings and regional and national conferences, and also in teaching cost accounting, illustrates the importance of this basic idea, and of being clear as to what uses or purposes are in mind when discussing the merits of various procedures. It is these uses and purposes which make cost accounting such an important tool of management.

This paper therefore is a sort of staking out of the field of cost accounting in the territory of administration. It is not a fully detailed statement of this field, but the main uses of cost accounting are dealt with. Uses which may seem to be omitted are for the most part subdivisions of the main uses.

The controversial questions of the selection of cost methods to serve specific purposes, and the still more controversial questions arising out of the interpretation of cost results, can well be dealt with at later stages of the Committee's work. But it is believed that this paper will help not only to define, but also to reduce, those areas of controversy.

Articles published in the *Bulletin* present many different viewpoints. In publishing them the Association is not sponsoring the view expressed, but is endeavoring to provide for its members material which will be helpful and stimulating. Constructive comments are welcomed and will be published in the Forum Section of the *Bulletin*.

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NATIONAL ASSOCIATION OF
COST ACCOUNTANTS

MAY 15, 1946

THE USES AND CLASSIFICATIONS OF COSTS

Costs Are a Means to an End

COST accounting is a means to an end, and not an end in itself. Accordingly, any study of the field of cost accounting should start with a study of the ends to be served—the uses to be made of cost data. Only by clearly describing and relating the various purposes for which costs are to be used is it possible to determine the types of cost data needed for each purpose and the principles and techniques which should govern their development.

Costs are used for a variety of purposes, and the same cost data cannot serve all purposes equally well. Many of the apparent differences of opinion among cost accountants are not fundamental but arise from failure to recognize that cost data prepared for one purpose may not be appropriate for other purposes. The present paper is an effort to state the various uses to which costs are put in the internal management of industrial enterprises, to suggest the types of cost data which best serve each purpose, and to mention some of the problems involved in developing such costs. While cost information is needed frequently for government reports and other public purposes, no attempt is made here to consider the ways in which costs are used outside of the business enterprise for regulatory and other purposes, except as these are part of the normal functions of management listed below.

Cost Occurrences and Cost Characteristics

Before proceeding to discuss the ways in which costs are used and the types of cost which are needed for each of the various uses, it should be pointed out that cost transactions—the events by which the business first incurs the costs—do not usually occur in such form nor at such time as to furnish ready-made costs suitable for use for the purposes for which they are intended. The entries which are made to record these transactions as they occur are very necessary; but they are, so to speak, the raw materials of cost accounting. It is by classifying and analyzing these and by rearranging them into various patterns that the desired information is furnished in usable form.

What "usable form" means will be shown later. It is sufficient here to illustrate briefly some kinds of cost behavior, simply to

show how varied are the characteristics of the materials which the cost accountant must classify.

When piece rates are paid to workmen performing operations on a product, it is clear that those piece rates are costs which are very directly related to that product. It is also clear that they are *manufacturing* costs which are pretty definitely associated with the period in which they are earned and paid. But these piece rates will not enter into *cost of goods sold* in that period unless the products themselves are sold in that period. If they are not, but are carried forward as inventory to be sold in the next period, these piece rates will become part of the *cost of goods sold* of that period.

Very different in character is a fire insurance premium paid, and covering a period of three years. It cannot be said that this cost has any close relationship to any given product turned out within the three years. Everybody will probably agree that *some* share of the premium should fall upon that product, but *how much* should be so treated is a question which runs into many complications. On the other hand the premium is definitely tied to the three-year period, and it is not unreasonable to charge one-third of it to each of the years.

Without going further with these ideas at this time, they clearly point the way to a need for developing, from the costs as first incurred, various types of cost classifications for different uses.

Uses of Cost Data Classified

The collection and analysis of cost data should be directed at serving the following essential purposes:

a. Determination of periodic profit, including inventory valuation.
b. Budgetary planning.
c. Cost control.
d. Pricing policy.
e. Current applications of plans and policies.

Different Types of Costs Needed for Each Purpose

The process of measuring periodic profit involves the matching of incomes and costs on some consistent basis. This includes the application of costs to units of product as a basis for separating the costs applicable to units sold from the costs applicable to the units

remaining in inventory. It is historical in nature since it involves a reporting on what has already happened. For this purpose historical costs are needed.

In planning for the future, management is concerned primarily with finding that combination of income, costs, and volume which will yield the greatest net profit return. For this purpose management needs the best possible estimate of expected "actual" costs for each set of conditions under review.

The control of costs involves the adoption of standards of comparison. Usually the best procedure is a predetermination of what costs should be and a comparison of actual costs with the predetermined standards. Control is achieved through efforts to keep actual costs in line with predetermined standards and by comparison of actual costs with these standards to reveal out-of-line performance in order that steps may be taken to remove the causes.

The purpose of pricing policy is to determine the price for a product which will permit a maximum total profit over a period of time, giving effect to the costs for those volumes which the determined price is expected to produce and allowing for the averaging effect of subnormal and abnormal years in the planned period. For this purpose management needs projected product costs based on its determination of normal capacity. Long-range pricing policies having been decided, deviations from the price policy to meet short-term conditions require cost and other data based on those short-term conditions as discussed below.

Management is constantly faced with the tactical arrangements and decisions which are needed to implement the strategy of the over-all plan. These usually involve a choice from among alternative courses of action and give rise to questions as to the costs and related income involved in each alternative. Included in this category are such problems as whether to make or buy a component part, to replace or not replace a piece of equipment, to accept or reject business offered at a special price, to substitute materials, to change method of production, etc. Obviously the costs needed for each purpose must be those which are pertinent to the immediate problem. In general, they will be the expected actual costs relating to the specific situation.

Cost Classifications

Cost accounting involves both analyses and syntheses. It involves breaking down the stream of costs into its elements and the grouping of these various elements into the combinations best suited to the purpose in hand. In these processes numerous bases for classification are used. These include classifications as to—

Capital and income charges.
Product costs and period costs.
Direct costs and indirect costs.
Job or project costs and process costs.
Actual costs, standard costs, and normal costs.
Fixed costs, variable costs, and semi-variable costs.
Functional costs.
Incurred costs and applied costs.
Inventory costs and over-all costs.
Sunk costs and current outlay costs.
Historical costs and expected or anticipated costs.

Different combinations of cost elements are necessary to answer properly the various questions which involve the use of cost data. A prerequisite to proper combination is a sufficiently detailed classification of costs as they arise. The remainder of this paper will be devoted to a discussion of the ways in which these cost classifications are used in developing the types of cost data which will be of greatest usefulness to management for the five purposes listed earlier.

A. Development of Costs for Profit Determination

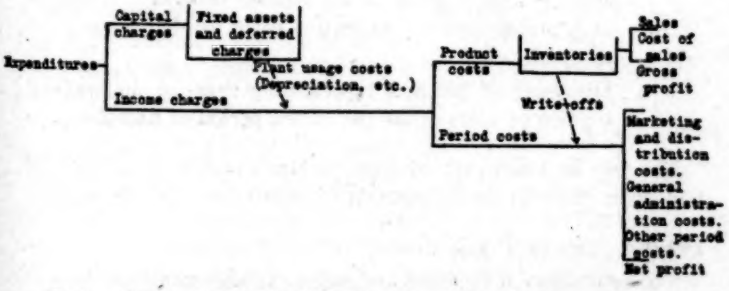
The use of costs for profit determination will be discussed first. In the course of this discussion a number of cost classifications will be described which also will have a bearing on the other uses of costs. While, therefore, these classifications are here related primarily to the problem of profit determination, they will serve also when it comes to discussion of the other uses. For this reason they are described fully here, but will be referred to under other uses only as necessary.

In a sense, all costing for profit determination purposes is concerned with the allocation of historical costs to periods of time. In this process of measuring the costs applicable against the income

of an accounting period three areas of decision are recognized:

1. *Capital vs. income charges.* This involves the division of expenditures as incurred into two groups: (1) those applicable to the current accounting period only, generally called "income charges," and (2) those applicable to more than one accounting period, generally called "capital charges."
2. *Product costs vs. period costs.* This involves the division of the income charges into (1) those which attach directly to the product (product costs) and (2) those which are directly applicable against the income of the period (period costs).
3. *Cost of goods sold vs. cost of inventory.* This involves the application of the product costs to the units of product to permit the separation of costs applicable to products sold from the costs applicable to products remaining in inventory.

The way in which these three steps or stages in classification serve to separate the costs which are applicable against current income from the costs which are deferred as fixed assets, deferred charges, and inventories for application against the income of future periods is illustrated in the following diagram:



Each of the above classifications presents its own problems, many of which are not susceptible of precise measurement or solution. Some of the principal problems in connection with each classification are outlined below.

Capital vs. Income Charges

The division of the life of a business into short time periods for profit determination purposes confronts the accountant with the problem of spreading costs over time periods. The shorter the time between reports the greater the problem of allocation, and the more the sound interpretation of the results is dependent upon an understanding of the bases of allocation. The allocation of costs over time periods involves: (1) determination at the time the expenditure is incurred whether it applies only to the current accounting period (income charge) or applies to a number of accounting periods (capital charge) and (2) spreading the cost of capital charges over the accounting periods to which they apply. Some of the major problems in this area are concerned with—

1. Distinguishing between expenditures which are incurred for the benefit of several accounting periods and those which are incurred for current maintenance of facilities whose original cost is being spread over future periods.
2. Estimating the total time period over which the cost is to be spread and subsequently correcting errors in estimates as they become apparent.
3. Determining whether expenditures applicable to more than one accounting period should be spread over the applicable periods on a strict time basis or whether consideration should be given to the relative benefits accruing to each period (use or production basis for depreciation, as an example).
4. Disposing of balances representing over- or underamortization of costs at the end of the period of usefulness.

The way in which each of these problems is solved can have an important effect on the distribution of profits over periods of time.

Product Costs vs. Period Costs

The separation of the costs assigned to an accounting period into those which are applicable to products (product costs) and those which are applicable to the accounting period without assignment to products (period costs) is an established accounting practice. Generally, the costs of manufacturing are treated as product costs,

while the costs of general administration, marketing and distribution, and finance are treated as period costs. Among the problems involved in this classification are the following:

1. Should general administration and financial costs be treated wholly as period costs, or should they be divided between manufacturing and distribution as part product costs and part period costs, on the theory that manufacturing and distribution are the primary functions and administration and finance are secondary or service functions?
2. Should all fixed manufacturing costs of a period be absorbed in product costs or should they be absorbed at a normal rate with any unabsorbed balance treated as a period cost?
3. Where standard costs are used, when is it proper to treat debit variances as period costs (that is, as a loss of the period) in preference to their inclusion in product costs?
4. Costs having been assigned to products, to what extent is it proper to transfer a part of these costs applicable to inventories to period costs as losses of the current period because of anticipated lower recoveries in future sales?
5. Are the costs of research and development product costs or period costs?

Other problems might be mentioned, but the above are illustrative of the questions existing in the area. Significant variations in reported periodic profit can result from different selections of alternatives.

Cost of Goods Sold vs. Cost of Inventories

The application of product costs to units of products provides the basis for separating the cost of goods sold from the cost of goods remaining in the inventory in order that the former may be charged against income in the determination of periodic profit. This may be on an over-all company basis or by product lines or divisions. The major problems in this field include the following:

1. Selection of the costing unit, the job, process, or unit of product.

2. The classification of costs as direct and indirect with respect to the costing unit.
3. Departmentalization for overhead application and the accumulation of costs by departments.
4. The application of service department costs to products, usually through allocation to direct departments.
5. Determination of the level of operations at which fixed costs shall be fully absorbed, that is, normal or expected volume.
6. Determination of the base or bases for application of departmental overhead to products, that is, direct labor hours, machine hours, prime cost, etc.
7. The use of standard costs for inventory valuation, with the resulting division of historical costs between standards and variances from standard and the further problem of the disposition of the variances.

The decisions reached with respect to each of these problems can have an important influence on the valuation of inventories and the division of reported profits between accounting periods.

B. Budgetary Planning

The ways in which costs are classified and combined for planning and other purposes will be influenced to a large degree by the concepts and decisions as to the methods of classification and combination developed for use in determining profits and valuing inventories. The final effect of the budgetary plan will be stated in terms of net profits—profits which will be measured by the accounting methods used for profit determination purposes. Accordingly, it is customary to apply the same concepts and follow the same accounting classifications and practices in developing costs for planning as in developing costs for profit determination. Problems of time allocation, classification of product costs and period costs, and the costing of products are handled in the same way for both purposes. The vehicle most commonly used for planning purposes is the forecast budget. In budgeting, the forecast income statement is usually prepared in substantially the same form as the historical income statement.

At the same time, the cost data developed for profit determination purposes provide the starting point for the development of the expected actual costs needed for planning purposes. Assuming no significant change in products or methods, the adjustment of past costs to provide the expected actual costs for planning purposes largely relates to forecasts with reference to—

1. The prices which will prevail during the budget period for material, labor, and services.
2. The efficiencies which can be expected in the utilization of material, the application of labor, and the utilization of facilities and services.
3. The influence of volume or rate of activity on costs.

Aside from whatever part he may play in forecasting anticipated prices and efficiencies for the forecast period, the cost accountant's principal problem will be concerned with measuring the effect of volume or rate of activity on costs. This is primarily a problem of the separation of the fixed and variable elements of cost, and (because the valuations placed on inventories affect the projected profit) the application of fixed costs on the basis of some unit of output, either at normal capacity volume or anticipated volume, depending on which is used for profit determination purposes. Obviously, the forecast profit will be affected by the rate of activity which is selected for this purpose.

C. The Control of Costs

Control presupposes effort directed toward a desired result. It involves not only the predetermination of the desired result but also the action to be taken to achieve a conformity of the actual results with the planned results. In cost accounting language this means the establishment of standards and budget allowances along with action to assure that the standards and allowances are met. In the following discussion the term standards will be used to include both standards and budget allowances, since both represent standards of expected performance.

Control of costs is obtained either (1) at the time costs are incurred by the person responsible for them or (2) through action taken as a result of accounting reports to eliminate the causes of

the variances between actual costs and standard costs which are revealed by such reports. The cost accountant's part in the control of costs is concerned principally with the latter step, although he does have an important part in the preparation and assembly of the standards which are utilized in connection with both steps.

The comparison of historical with standard costs to determine variations from standard performance may be made off the books after the historical costs have been developed there, or the standards may be incorporated with the historical costs on the books and the variances developed as a part of the accounting routine. Whichever method is followed, useful comparisons for cost control purposes can be made only if both historical and standard costs are so classified as to—

1. Permit the determination of the responsibility for and the causes of variations from standards, and
2. Permit determination of standard allowances at various volumes based on the variability of the costs with changes in the rate of activity.

Cost control differs from costing for profit determination in that cost control is concerned with the charge at the point of origin, while cost determination is concerned with its disposition. Effective control of costs requires their classification in terms of the individuals responsible for their incurrence. Determination of the causes for variations from standard requires a finer subdivision of costs by nature of expenditure than is necessary for cost finding. Thus the incorporation of standard costs with actual costs on the books of account necessitates a modification of the basis of cost classification at the point of origin to provide the classification of costs needed for control while at the same time retaining the other classifications needed for profit determination.

With cost control based on a predetermination of what costs should be, a classification of costs as to degree of variability with changes in the rate of activity is needed for a determination of allowable costs at various rates of activity. Classification of costs on the basis of variability has made possible the variable or flexible budget. By developing standards in the form of rates per unit

of activity for fully variable costs, fixed allowances for wholly fixed costs, and both rates and allowances for semi-variable costs measurement of performance as a step in control is made possible for any rate of activity experienced.

D. Pricing Policy

In this discussion a distinction is made between the determination by management of long-term pricing policies and the making of day-to-day decisions with respect to deviations from the established price policy over the short run. The types of costs needed for the latter purpose will be discussed in a later section.

For pricing policy purposes management is concerned with—

1. Costs in terms of units of products.
2. Over-all costs to make and sell rather than costs for inventory valuation.
3. Cost differentials arising from different methods of sale and/or delivery.
4. Normal costs rather than short-run actual or expected costs.

Since prices are significant only as related to specific products, costs for this purpose should be product costs. Moreover, if management is to relate costs to selling prices, the unit product costs should include, in addition to the costs developed for inventory valuation, those costs of marketing and distribution and of general administration which it is practical to allocate to product units. Included in this category are those costs of marketing and distribution which vary with the terms and conditions under which the goods are sold. The same product may be sold to different customers under different terms and conditions, resulting in different marketing costs. Sales volume, customer location, credit and transportation terms, service guarantees, installation services, and other factors will influence the costs of marketing and distribution and will usually be reflected in price differentials. These cost differentials are significant data for management use in the development of a pricing policy. Whether, in addition, those costs of marketing and administration which are joint costs with respect to products and methods of sales should be allocated to product units for this purpose would appear to depend on whether the management of

the individual company desires for this purpose a complete over-all product cost or prefers to consider the recovery of these joint costs as coming from the over-all margin provided by the differences between selling prices and product costs.

In the establishment of pricing policies management is concerned with the long-run normal costs of the product rather than the costs which may obtain over a shorter period. Unit costs based on the short run are high when production is low and low when production is high, while market prices tend to move up and down with the rate of industrial activity. Unit costs based on the short-run are unrealistic for long-term pricing. Instead management needs a normal cost so developed as to indicate what the cost of a product will be over a period long enough to level off the ups and downs of high and low production—in other words, a product cost in which the fixed costs are spread evenly over the units produced rather than over periods of time. Normal costs are developed through the application of indirect costs to products by a rate based on management's determination of normal capacity or normal utilization of the capacity over a relatively long period of time.

For pricing policy purposes costs need to be normal in another respect. No company can expect over the long run to recover in the selling price of its products excess costs due to poor purchasing, inefficient methods of production and distribution, and the inefficient use of productive capacity. Thus the costs supplied management for pricing policy purposes should be based on much the same concept as for cost control—a concept of what the costs should be at normal efficiency.

E. Current Application of Plans and Policies

Policies, plans, and forecasts, despite their usefulness in the management of a business, do not eliminate the need for continuous management action in meeting current problems. Policies and plans deal with norms which management hopes to attain over the long run. Normal conditions seldom prevail over short periods of time, and management is constantly faced with the need for modifying and adapting the long-range plans and policies to the conditions which exist in each particular stage of the shifting business picture. The application of plans and policies in line with current

conditions usually involves a choice from among alternative courses of action, and the expected cost under each alternative is often the decisive factor in determining which course shall be pursued. A few illustrations will indicate the cost problems involved.

Consider first a problem involving a decision on whether to make a particular part by hand or on a special machine. Obviously one factor, if not the most important factor, in the solution of this problem is the relative cost of the two methods of manufacture. Assume first that the company in question does not possess the type of machine needed for this operation, but will need to acquire the machine if this method of manufacture is decided upon. Under these circumstances, the cost of manufacture by machine will need to include an allowance for the depreciation or amortization of the cost of the machine over its useful life. Difficult questions are involved in developing this depreciation allowance. If the manufacturing cost per unit by machine, including estimated depreciation, is less than the cost per unit by hand, machine production should be selected, other things being equal. Now let us assume that the question of manufacturing this part by machine or by hand arises again at a later date after the machine has been acquired. Assuming no alternative use for the machine, there is some question as to whether the cost of production by machine should include machine depreciation. The cost of the machine is a "sunk" cost; it will not be increased or decreased by the extent of machine use. So long as there is no alternative use for the machine only the current outlay costs of manufacture appear to be involved in choosing between the alternatives of machine production and hand production; they are the only costs which will be affected by the decision.

Similarly in deciding the question of whether to make or buy a part, management's decision should be based on costs relating to the conditions which exist at the time the decision is made. If additional facilities will be required to make the parts the costs for use in comparison with the outside purchase price should include an allowance for amortization of the cost of such facilities. On the other hand, if idle or only partially engaged facilities suitable for the manufacture of the part already exist, it is questionable whether the cost for comparison with the outside purchase price

should include depreciation. Any favorable difference between the current outlay cost of making the part and the cost of purchasing it will represent a recovery of part of the cost "sunk" in the original purchase of the facilities.

Even in such problems as the replacement of equipment the current outlay cost concept applies. In comparing costs based on the use of present equipment with costs based on the use of replacement equipment, it would appear that depreciation on present equipment should be excluded. These costs have already been incurred; their amount will not be changed by the continued use or lack of use of the present equipment.

It should be recognized that all decisions on day-to-day problems of this type need to be made on the basis of the conditions known or forecast at the time the problem is faced. Changes in surrounding conditions change the basis for solution and influence the cost data needed for that purpose. Accordingly, these decisions need frequent review. Moreover, the fact that costs were developed in a certain way for the purpose of reaching a decision does not necessarily mean that similar methods should be used on the books for developing the historical costs. The use of current outlay costs to justify the manufacture of a part formerly purchased represents a special use of cost data for a specific purpose, and should not lead to the exclusion from costs developed for other purposes of the fixed costs normally applicable thereto.

Summary

Management uses cost data for a variety of purposes. A clear understanding of the ways in which costs are used by management is a prerequisite to proper consideration of the types of cost data needed. The purpose of this paper has been to suggest the ways in which costs are used by management, to describe in general terms the types of cost data best suited to each use, and to indicate the problems involved in the development of such costs. The object has been to provide in outline form a picture of the field of cost accounting and an indication of the areas within the field which merit further research study.